TRANSCRIPT OF RECORD

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1925

No. 744

CONCRETE APPLIANCES COMPANY AND WILLIAM H. IRSLEY, PETITIONERS,

vs.

JOHN E. GOMERY, JOHN C. SCHWARZE, MICHAEL J. O'HEARA, ET AL.

ON A WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE THIRD CIRCUIT

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VOLUME II

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Friday, May 27th, 1921, 10 a. m.

Met pursuant to adjournment.
Same parties present.

Direct examination of witness Brown continued by Mr. Barton:

Q. 74. Reference has been made to a section of the trémie pipe; this section has been sent for and I will ask you to state whether this piece which is now before us is the one referred to?

A. You are talking now of the piece of trémie pipe that we had talked of last evening; the piece of pipe that we were talking of last evening is the piece in question.

Q. 75. You may state again when you got that particular piece and what you did with it on Wednesday last.

A. The piece of pipe in question that I had shown to Mr. Barton on Wednesday last I had taken from barge and placed on bank at the direction of Mr. Barton.

Q. 76. Referring to the sketch or drawing which we had before [fol. 675] us yesterday, you will note that I have had the different figures numbered as "Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5;" I also have marked on the figure "Defendants' Exhibit San Francisco Barge Apparatus May 27th, 1921," preparatory to offering it in evidence. Will you just state by reference to the designations what each figure in a general way represents?

Mr. Lyon: Objected to as leading and suggestive, incompetent, irrelevant and immaterial, no foundation laid, not the best evidence, no proper foundation laid for the introduction of secondary evidence.

A. Fig. 1 showing operating platform and sheave and lead blocks at head end of tower; also bunker for receiving material and below mixer and boiler and engine. All of the above are on the after end of barge. Fig. 2 shows cut of boom fastenings; also timber that is placed on any section of tower to allow the raising or lowering of boom as found necessary. Fig. 3 shows boom timber as bolted to tower. Fig. 4 shows boom timber in place bolted and with supporting strut in place. Fig. 5 shows view looking down on tower from inside, showing four main supports and section of boom fastenings in place.

By Mr. Barton: The sketch or drawing referred to is here offered in evidence as "Defendants' Exhibit 61, San Francisco Barge Apparatus, May 27th, 1921."

Mr. Lyon: Objected to as leading, incompetent, no foundation laid, and not the best evidence, no foundation laid for the introduction of secondary evidence, and as irrelevant and immaterial.

Mr. Barton: Direct examination closed.

[fol. 676] Cross-examination by Mr. Lyon:

X Q. 77. In what business is the Healy-Tibbetts Construction Company engaged?

A. The general contracting business, such as the building of bulkheads, wharves, bridges, highway work, rock quarries and bunkers, and also general concrete cylinder work.

X Q. 78. After the San Francisco earthquake and fire of 1906 the said Company built a large number of office, store and warehouse buildings in the rebuilding of San Francisco, did it?

A. Yes, general concrete construction and pile driving foundation work.

X Q. 79. How was the concrete on those respective buildings handled and distributed?

A. The concrete in those buildings were handled by different methods, the one found most practical being used. Where a building of any height was under construction, hoist towers and chute pipes were used where found practical.

X Q. 80. And where such hoist towers and chute pipes were used the chute pipes were supported by saw horses or supports resting upon the floor or other stable portion of the structure?

A. Yes, in most cases, but where small pockets in the building were to be filled in some cases a light trémie pipe was used supported from tower by boom.

X Q. 81. Where did you use such pivoted pipe and boom in 1906 or 1907 on buildings?

A. On the buildings—well, I cannot recall at present of any particular building but the Wellman Peck Building on Pine off Market, the Gunst Building, and Tillman and Bendel Building. I made a mistake in the name of a building, in place of the Wellman and Peck I meant Tillman and Bendel.

[fol. 677] X Q. 82. When was this Tillman and Bendel Building erected?

A. The exact date I cannot remember, but shortly after the fire.

X Q. 83. Can you give the year?

A. No, not off-hand I could not, without looking up the records. We built at that time, in the years I would say from 1906 to 1910 a great many buildings, but as to the exact dates I cannot recall at the present time in my mind.

X Q. 84. Then you would not be able to give me the year that any of those buildings were built; is that it?

A. Not off-hand, without looking up the records, to be exact.

X Q. 85. Now, as a matter of fact, did not the Healy Tibbetts Construction Company, where it did not use the wheelbarrow method of distribution of concrete in the erection of concrete building construction work in the years immediately following the 1906 earthquake and fire, simply use a temporary wooden trough supported from the floor of the structure by means of wooden supports?

A. In most cases that was the method used throughout the placing of concrete, but as I stated before, in cases where it was not practical to put in the concrete wooden chute to get into tight places or around

corners, a trémie chute would have been used as it would move and was more flexible to get into corners and places.

X Q. 86. How many floors were there in this Tillman and Bendel Building?

A. As near as I can remember there were six stories, and I also want to state that I am not positive in the number of floors as I was not directly in charge of the concrete construction work of the building.

[fol. 678] X Q. 87. And you are depending upon mere recollection that a trémie pipe and boom were used at all on that building, are you?

A. Just from mere recollection, as I would not have direct charge of that work, but I can recall of such a method being used at times.

X Q. 88. According to your recollection, on which floor in the erection of that building was that used?

A. On that one particular building I cannot recall the floor it was used on, but remember of the pipe and small boom being sent to the work for such a purpose.

X Q. 89. Do you remember actually seeing it in actual use on any one of the floors in that building?

A. No, I cannot positively state that I saw it in operation.

X Q. 90. The same is true, is it not, Mr. Brown, in regard to the Gunst Building?

A. In any of the buildings, yes.

X Q. 91. The reason I put the last question in the manner I did is that Mr. Horton stated that a trough and its support by wooden supports on the floor of the building was the only way that any gravity distribution of concrete was used by the Healy-Tibbetts Construction Company in the building of buildings, and I was wondering if your memory was more clear and definite in regard to this than that of Mr. Horton. If I understand your testimony correctly, it is that you yourself were not directly employed upon any of these buildings; is that correct?

By Mr. Barton: I do not find in Mr. Horton's deposition basis for so broad a statement as is contained in the introductory part of this interrogatory, and therefore object to the same as not accurately stated as to what Mr. Horton says in his deposition.

[fol. 679] Mr. Lyon: Read the question to the witness.

(Question read.)

A. That is correct with one exception: That being in charge of the erecting of derricks and the like for the Healy Tibbetts Company, I was in a way employed all over their construction work, but as for the actual concrete work and the pouring of same through chutes or trémie I had nothing whatever to do, only if called upon to furnish them some equipment.

X Q. 92. How many floors were there to the Gunst Building to which you have referred?

A. As I stated before, as to the number of floors in any of the buildings I cannot state correctly at the present time, as I had noth-

ing whatever to do with the construction end as far as the concrete building was concerned.

X Q. 93. Both the Gunst Building, to which you refer, and the Tillman and Bendel Building occupied relatively large space, did they? In other words, they were large buildings?

A. Yes, both were large buildings.

X Q. 94. And the Healy Tibbetts Construction Company erected quite a number of the larger and more important office, store and warehouse buildings that were erected in San Francisco after the earthquake and fire of 1906, did they?

A. They erected a great many of the buildings as far as the foundation and floors were concerned, and in some cases the complete building, and others the finishing work was completed by other contractors.

X Q. 95. In your last answer when you say "finishing work," you refer to such things as the electric wiring, plumbing, carpenter work, and general finishing work?

A. Yes.

Mr. Lyon: That is all.

[fol. 680] Redirect examination by Mr. Barton:

R. D. Q. 96. Please describe a little more fully the piece of the trémie pipe that is before us. This piece——

Mr. Lyon: Objected to as incompetent, not the best evidence, the said piece of pipe speaking for itself and showing for itself, and as not redirect examination, and as incompetent, no foundation laid.

A. The piece of pipe in question is known as the head end of trémie pipe and is placed directly under receiving hopper when concrete is poured from the concrete hoist into receiver. This section of pipe originally was about 3 feet long, about 13 inches in diameter at the large end, tapering to 8 to 10 inches, each section following it was made of telescoped pipe to fit and fasten the same to avoid waste of concrete or in other words, to save the material from spilling on the way to its destination.

Martin E. Brown.

Fred L. Ayer, the next witness, having been sworn according to law, testifies as follows:

By Mr. Barton:

Q. 1. Please state your name, age, residence and occupation.

A. Fred L. Ayer; 1466 Tenth Avenue, San Francisco; I am in the wood business; I am 53 years of age.

Q. 2. What was your business in 1904, '05, and '06 and '07?

A. Pile driving and bridge work.

Q. 3. And for whom did you work?

A. Principally Healy & Tibbetts.

Q. 4. Are you acquainted with Mr. Charles C. Horton and Mr. Martin E. Brown?

A. I am.

Q. 5. What is the kind of work that the Healy Tibbetts Con-
[fol. 681] struction Company does? Tell in a general way.

A. Well, from grading a lot to building a building; all kinds of bridge work and structural iron work; bridge and pile driving. Also do highway grading work.

Q. 6. How long is it since you worked for the Healy Tibbetts Construction Company?

A. About five years, I think.

Q. 7. Going back to the time of the earthquake and fire, you may state if you remember what work you were doing for the Healy Tibbetts Construction Company.

Mr. Lyon: Objected to as leading and suggestive.

A. Just before the fire I worked for Healy Tibbetts Construction Company on pier 42, I believe, constructing the pier. I think it was 42, if I remember right.

Q. 8. Now, what part did you take in such work; what did you personally do at that time?

A. Well, I done a little of all; I am a pretty handy man and worked at all parts of it; the carpenter end of it as a rule.

Q. 9. What was the construction of pier 42; was it of concrete work or otherwise?

A. It was concrete, what we call a concrete pier.

Q. 10. Just how was the work done; what machinery or apparatus did you have?

A. Pile drivers and scows to handle cylinders. We have to have a false work first; then we drive cylinders, what we call them, and then we fill them with concrete; and in filling them with concrete we have a concrete mixer on a barge and we have an elevator built on the barge to handle the concrete to put it into the different cylinders.

Q. 11. Describe the elevator you have referred to.

A. Well, it is a construction that we made in the plan of a tower, which carries the bucket up to a hopper near the top that they
[fol. 682] dump the rock in, and we have also an engine to hoist the cement up with on a platform, and that is dumped into a hopper with the rock, and that goes down an iron pipe to the cylinders. The pipe was constructed in short lengths. The pipe was handled, you might say, by a boom. If anybody understands construction, that is the outline of it.

Q. 12. Describe the boom more fully.

A. Well, the boom is the bottom end of it, and sets in a hinged socket, I would call it, and the outer end has a sheave in the end of it, the cable runs from the donkey engine to the sheave in the outer end, which is used to handle the pipe that carriers the cement to the cylinders. All the use of this boom is to handle the pipe that carries the cement.

Q. 13. What supported the tower?

A. The tower? I do not get you.

Q. 14. You spoke of the tower; where was the tower placed, on what foundation?

Mr. Lyon: Just a moment. Objected to as incompetent, not the best evidence, no foundation laid for the introduction of secondary evidence, and this objection is reserved and taken to all questions asked and answers given by this witness, without the necessity of hereinafter repeating the same. The objection is reserved in this manner, in order not to further interrupt the testimony of this witness, and with the consent of counsel for defendants.

A. On a barge.

Q. 15. Do you know where the barge is now?

A. I couldn't say where the barge is. You might find out by asking the people where the barge is.

Q. 16. Did you see the barge and apparatus you have referred to before the fire?

A. Yes, sir.

Mr. Lyon: Objected to as leading and suggestive.

[fol. 683] Q. 17. What inspection, if any, did you make yesterday at my request?

A. I looked at the part of the old tower and I see that it was the same construction that we used before the fire.

Q. 18. And was it high tide so that you could not see the barge?

Mr. Lyon: Objected to as leading and suggestive.

A. It was.

Q. 19. Describe what you did see yesterday and describe where the tower was.

A. Well, the tower lies in Healy Tibbetts boom near Kentucky Street. I should judge near 20 or 30 feet of the old construction is intact now. That means a part of the tower. I looked it over and satisfied myself that it was the same tower that we used on the barge for handling concrete.

Q. 20. You mean the same tower you used on the barge back in 1906?

Mr. Lyon: Objected to as leading.

A. Yes.

Q. 21. We have before us a piece of material, and I will ask you to state what it is.

A. A jointed pipe which was used as the first joint below the hopper.

Q. 22. When was it used?

Mr. Lyon: That is objected to as incompetent, no foundation laid.

A. I would say we used the same piece or similar to that one in all our work. We couldn't do without one.

Q. 23. At what time?

A. In handling the concrete for building material on piers 43 and 45—no, piers 42 and 44.

Q. 24. And what was the year?

A. 1905 and 1906. We have used them since then.

[fol. 684] By Mr. Barton: The piece of pipe referred to is offered in evidence, to be marked "Defendants' Exhibit 62, Piece of Pipe."

Mr. Lyon: Objected to as incompetent, no foundation laid, as fragmentary, not the best evidence, not the proper method of proof, is irrelevant and immaterial.

Q. 25. I wish you would describe more in detail the manner in which the concrete was handled in the construction of piers 42 and 44.

A. Well, it was brought to the pier—the rock for the concrete—on barges, and put in hoppers, carried to the top of the tower, where it was mixed with cement, and poured down a lengthy pipe to the different cylinders. The pipe was taken off as the cylinders were filled, that is, the pipe is disconnected as the cylinder is being filled, and this pipe is carried around to three or four different cylinders before the tower has to be moved. The rock is carried up one shaft and the cement is carried up in slings to a platform on top of the tower. That is about all I know to explain about it, but I can draw a picture of it.

Q. 26. Referring to the barge on which the tower was placed, I will ask you what there was at the foot of the tower; that is, on the level with the deck or top of the barge.

A. Well, for one thing, there was a donkey engine on there used for hoisting purposes.

Q. 27. And what else?

A. The concrete mixer was there, and a centrifugal pump, and clam shell, and two or three big iron buckets, and wooden tubs; that is about all we used in digging out a cylinder.

Q. 28. And where was the mixer placed with respect to the tower or near to it?

[fol. 685] As near as I remember it was pretty close to the tower.

Q. 29. What was done with the mixer?

A. Well, we used it to mix concrete with.

Q. 30. And after the concrete was mixed by the mixer, what was done with it at first?

Mr. Lyon: Objected to as leading and suggestive.

A. Well, the first concrete we used is lowered down to the bottom of the cylinder placed in a square box for the foundation of the cylinder.

Q. 31. I was referring to the mixer on the barge. You have said that the mixer was used for mixing the concrete; I understand it was mixed into a mush. How did the mush get out of the mixer?

Mr. Lyon: Objected to as leading and suggestive and assuming facts not testified to by the witness.

A. The mixer being in action the concrete would surely go out.

Q. 32. And where did it go to?

A. This mixer was set on a platform at the top of the tower for mixing a portion of the mush.

Q. 33. Do you mean at the top of the tower or at the foot of the tower?

Mr. Lyon: Objected to as leading and suggestive, and an obvious attempt to change the testimony given by the witness.

A. One particular job we had the mixer part way up on the tower or near the top, on a platform where the rock from the hopper run into the mixer and cement was put in and the mixer in action it emptied into a pipe which carried it to the cylinders, and afterwards we had a mixer at the bottom of the tower or near the tower where the concrete was mixed and hoisted to the hopper and that was [fol. 686] emptied into the pipe which carried the cement to the cylinders.

Q. 34. I will ask you if, when the mixer was placed at the foot of the tower, the cement or mush went first from the mixer into a bucket or skip?

Mr. Lyon: That is objected to as leading and suggestive.

A. It did. It was carried up the center of the tower.

Q. 35. When this skip or bucket with the mush was carried up to the top of the tower, what was done with the mush?

Mr. Lyon: That is objected to as assuming facts not testified to by the witness.

A. It was emptied into a hopper, which was connected with the pipe, which carried it to the cylinders.

Q. 36. How was the mush after it was in the hopper allowed to get into the pipe?

A. Well——

Mr. Lyon: Same objection.

A. It had a small slide on the bottom of the hopper which was open and shut at the will of the man handling the pipe.

Q. 37. Where was the man placed that was handling the pipe; where did he stand?

Mr. Lyon: Same objection.

A. Near the hopper.

Q. 38. How did he know when to open the slide and when to close it?

A. He had signals from the man in the cylinder; he has a line to give signals to the man handling the chute, or in charge of the chute.

Q. 39. About what was the diameter and length of these cylinders? [fol. 687] A. As near as I remember, they run from 48 to 60 feet, there might have been some a little longer. It is quite a long time ago and I have forgotten just the length of the cylinders.

Q. 40. About what was the diameter?
A. I think an average of 5 feet.
Q. 41. I understand that there was a man down in the cylinder as the concrete was being placed and that this man down in the cylinder would give the signal to the man on the platform to open the gate; is that correct?

Mr. Lyon: Objected to as leading and suggestive.

A. It is, as I stated before.
Q. 42. About how large was the barge on which this tower and other apparatus were placed; how long was it, about, and about how wide and about how deep, according to your best recollection?
A. About 30 feet wide, and about 60 feet long, and about 8 feet in depth, as near as I remember. It might have been a little larger, but I don't think it is any smaller.
Q. 43. How long did you work about that barge and about placing the cement in the cylinders?
A. Well, the first time I think about six months; the second time about four. If it was necessary I guess the company's time book would show how much time was put in.
Q. 44. What was the time of the first six months? What year?
A. In 1905.
Q. 45. And what was the year about four months?
A. In 1906.

Mr. Lyon: Let the record show that at this point counsel for defendants places before the witness a drawing which has been [fol. 688] marked "Defendants' Exhibit San Francisco Barge Apparatus, May 27th, 1921." We object on the ground that it is calculated to further educate the witness for his further testimony in this case. It is clearly an improper proceeding.
The Witness: Take it away. This is the first time I ever saw that. I will draw one.

Q. 46. Are you accustomed to making drawings and to working from drawings?
A. I am not accustomed to making drawings, but I am accustomed to working from drawings.
Q. 47. I ask you to look upon this drawing which is now before you and state what it represents so far as you understand it.
Mr. Lyon: Objected to as incompetent, no foundation laid, not the proper method of proof, not the best evidence, no foundation laid for the introduction of secondary evidence, and an evident attempt to place before the witness exactly what it is that the witness is expected to testify to.
A. I would say this is a tower that would carry mixed concrete to cylinders with. The object in having a long pipe of this kind is so that there will not be too much concrete go into the cylinders at one time; it has to go in in small proportions. It has a boom to handle the pipe, so that it can fill several cylinders in the radius around that the pipe will reach to without moving the barge. The cylinders are not allowed to be filled full at one setting, so we drop

the cement in and get them up a certain height in each cylinder, and after standing so long they are refilled. That is about all.

Q. 48. Referring to this sheet of drawing, I will ask you whether or not the drawing illustrates the apparatus such as was used by [fol. 689] you in 1905 and 1906 in building towers—piers 42 and 44.

Mr. Lyon: That is objected to as leading and suggestive and incompetent, no foundation laid, not the best evidence, no foundation laid for the introduction of secondary evidence; calling for the conclusion of the witness and not for a statement of facts, and not a proper method of proof.

A. Yes. This is the same apparatus or similar to the one used.

Q. 49. You told me you were in the wood business; just what is your work in that connection now?

A. Buying the wood and selling it, and getting the money.

Q. 50. Do you saw it up?

A. I have men to saw it.

Q. 51. When I first met you you were helping the men haul the wood, were you not?

A. Yes.

Mr. Barton: That is all.

Cross-examination:

Mr. Lyon:

X Q. 52. What other piers did you work on for the Healy Tibbetts Construction Company besides piers 42 and 44?

A. Well, I have worked on several; I think 46, and I believe 53, and I was hurt on pier 13. Well, I would state that I have been working off and on for Healy Tibbetts Construction Company for twenty-five years.

X Q. 53. What year did you work on pier 46?

A. I couldn't say without looking up the records.

X Q. 54. What year did you work on pier 53?

A. I believe it was '14 or '15, as near as I remember.

X Q. 55. Was that pier built with concrete cylinders?

A. Yes.

X Q. 56. In building that pier, did you use a barge with a tower? [fol. 690] A. I don't just remember, but I could give you a little information about when we did use the tower.

X Q. 57. Did you work on pier 36?

A. I believe I did.

X Q. 58. Was that pier built in 1903?

A. I don't think it was; couldn't say offhand.

X Q. 59. Did you work on pier 38?

A. Yes, I did pier 38.

X Q. 60. Was that built in 1904?

A. I don't remember.

X Q. 61. Did either piers 36 or 38 have concrete cylinders?
A. Yes, sir; 26 had concrete cylinders.
X Q. 62. Well, how about pier No. 36?
A. Not having had charge of work on pier 36 I don't remember just the time it was built,
X Q. 63. Did you work on it?
A. I think I did; I am pretty sure I did. If I really knew what I came here for I could have brought the time book.
X Q. 64. Now, with whom have you talked regarding this old work before you started in to testify this morning? With Mr. Barton and with Mr. Martin E. Brown, and with Mr. Charles C. Horton of the Healy Tibbetts Construction Company?
A. Not any in regard to this testimony.
X Q. 65. You did talk, however, with them regarding this old barge down in the boom yard or whatever you call it of the Healy Tibbetts Construction Company, did you?
A. No, sir.
X Q. 66. You didn't talk with either Mr. Brown, Mr. Barton or Mr. Horton in regard to that?
A. No, sir.
X Q. 67. Say anything about that apparatus?
[fol. 691] A. No.
X Q. 68. You were here in attendance yesterday, were you?
A. Yes, sir.
X Q. 69. Did you go out to the boom yard or whatever you call it this morning?
A. No, sir.
X Q. 70. You didn't bring in this old piece of pipe?
A. I had it brought in.
X Q. 71. How did you come to have it brought in?
A. At the request of Mr. Barton. I came here straight from home this morning.
X Q. 72. Then you did have some talk with Mr. Barton regarding that old apparatus yesterday, did you?
A. I did, yesterday.
X Q. 73. And who else beside Mr. Barton had you talked with either yesterday or Wednesday regarding that old apparatus?
A. Mr. Brown asked me if — would go and see if that was the same rig that we had years ago; that is all the talk I had with Mr. Brown.
X Q. 74. According to your recollection, did you find all of the rig there?
A. No, sir. There was a dilapidated portion of it there.
X Q. 75. There is no portion of the boom there, is there?
A. It was high tide when I was at the boom and I don't really know. I was at the boom on business of my own.
X Q. 76. When you used "boom" in the last answer, you do not refer to the alleged boom of this apparatus, but refer to the boom in the sea sense, as where the old apparatus is confined within the boom; is that correct?
A. Where the pile drivers and logs are kept is called a boom.

[fol. 692] X Q. 77. Then you are unable to state just how much of this old apparatus does now exist; is that correct, Mr. Ayer?

A. Yes, but there is enough there to show that it is the original tower.

Mr. Lyon: That is all.

Mr. Barton: Commission closed. Certificate of the magistrate is waived by counsel.

Fred L. Ayer.

[fol. 693] STIPULATION RE TESTIMONY OF E. C. GERHARD

It is hereby stipulated and agreed by and between counsel for the respective parties that if E. C. Gerhard were to be recalled as a witness for defendants, he would testify that the Franklin School Contract was let June 28, 1909; and that the apparatus shown in Plaintiffs' Exhibit No. 31 was put into use in said building operations prior to January 1, 1910.

July 25, 1921.

STIPULATION RE EXHIBITS

It is further stipulated that Exhibit 52 was published August 12, 1915, and that the publications, from which the excerpts comprising Exhibit 64 were taken, were published on the respective dates appearing on said excerpts.

By Mr. Jones: Counsel for defendants offers in evidence the exhibits marked for identification in the foregoing depositions, i. e., Exhibits 1 to 34, inclusive; 36 to 45, inclusive; 50 to 62, inclusive, and additional exhibits marked as follows:

63, Certified Copies of Preliminary Statements in Two interferences.

64, Partial Copies and Reproductions of Miscellaneous Publications.

65, Certificates of Clerks of Courts.

By Mr. Hood: Plaintiffs object to the several exhibits offered in evidence by defendants as follows:

The objections heretofore entered of record as to any of the aforesaid exhibits are hereby repeated.

Exhibit No. 1 is objected to as irrelevant and immaterial because relating to a structure subsequent to the date of the Callahan invention.

Exhibit No. 2 is objected to as irrelevant and immaterial because [fol. 694] relating to a structure subsequent to the date of the Callahan invention.

Exhibit No. 3 is objected to as irrelevant and immaterial because relating to a structure subsequent to the date of the Callahan invention.

Exhibit No. 4 is objected to as not the best evidence; not properly proven.

Exhibit No. 8 is objected to as not the best evidence and not properly proven or pleaded.

Exhibit No. 9 is objected to as not the best evidence and not properly proven or pleaded.

Exhibit No. 12 is objected to as irrelevant, immaterial and not properly pleaded.

Exhibit No. 13 is objected to as not the best evidence and not properly proven.

Exhibit 14 is objected to as irrelevant and immaterial because relating to a structure subsequent in date to the date of the Callahan invention.

Exhibit No. 16 is objected to as not the best evidence and not properly proven.

All of Exhibit 17 except photograph A is objected to as irrelevant and immaterial because relating to structures subsequent in date to the date of the Callahan invention.

Exhibit 18 is objected to as not the best evidence and not properly proven.

Exhibit 19 is objected to as not the best evidence and not properly proven.

Exhibit 20 is objected to as not the best evidence and not properly proven.

Exhibit 21 is objected to as not properly pleaded.

Exhibit 22 is objected to as irrelevant and immaterial because relating to structures subsequent in date to the date of the Callahan invention.

Exhibit 23 is objected to as not the best evidence and not properly proven.

[fol. 695] Exhibit 24 is objected to as not the best evidence and not properly proven.

Exhibit 25 is objected to as irrelevant and immaterial because subsequent in date to the date of application of the Callahan patent in suit and as not pleaded.

Exhibit 26 is objected to as irrelevant and immaterial because relating to transactions subsequent in date to the date of the Callahan invention.

Exhibit 27 is objected to as irrelevant and immaterial because relating to transactions subsequent in date to the date of the Callahan invention.

Exhibit 28 is objected to as irrelevant and immaterial because relating to transactions subsequent in date to the date of the Callahan invention, and not properly pleaded.

Exhibit 29 is objected to as irrelevant and immaterial, not pleaded and not properly proven.

Exhibit 30 is objected to as irrelevant and immaterial, not pleaded and not properly proven.

Exhibit No. 31 is objected to as not pleaded and irrelevant and immaterial because relating to a structure subsequent in date to the date of the Callahan invention.

Exhibit No. 32 is objected to as not the best evidence and not properly proven.

Exhibit 33 is objected to as irrelevant and immaterial.

Exhibit 34 is objected to as not the best evidence, not properly proven and not pleaded.

Exhibit 36 is objected to as not the best evidence and not properly proven.

Exhibit 37 is objected to as not the best evidence and not properly proven.

Exhibit 39 is objected to as not properly pleaded.

Exhibit 40 is objected to as irrelevant, immaterial, not pleaded or proven.

[fol. 696] Exhibit 41 is objected to as irrelevant, immaterial and not properly proven.

Exhibit 42 is objected to as irrelevant, immaterial and not properly proven.

Exhibit 43 is objected to as irrelevant, immaterial and not properly proven.

Exhibit 50 is objected to as irrelevant and immaterial because relating to the structures subsequent in date to the date of the Callahan invention; and not proven.

Exhibit 51 is objected to as irrelevant and immaterial because relating to the structures subsequent in date to the date of the Callahan invention; and not proven.

Exhibit 52 is objected to as irrelevant and immaterial because subsequent in date to the date of the patent in issue; and not pleaded.

Exhibit 53 is objected to as irrelevant and immaterial because subsequent in date to the date of the Callahan invention; as not the best evidence and as not proven.

Exhibit 54 is objected to as not properly pleaded.

Exhibit 55 is objected to as not properly pleaded.

Exhibit 56 is objected to as not properly pleaded.

Exhibit 57 is objected to as not properly pleaded.

Exhibit 64 is objected to as irrelevant and immaterial insofar as any of the excerpts therein are subsequent to January 21, 1909, the date of application of the Callahan patent in suit.

[fol. 1] IN UNITED STATES DISTRICT COURT

[Title omitted]

NOTICE OF TAKING TESTIMONY—Filed December 2, 1921

Philadelphia, Pa., November 28, 1921.

Please take notice that on Wednesday, November 30, defendants will take testimony at the offices of Gillford & Bull, 141 Broadway,

New York, beginning at 10 o'clock A. M., before a competent Notary and continuing until the testimony is finished.

The witness will be C. W. Ellis, of the Reynolds Electric Company, 1123 Broadway, New York.

You are invited to attend and cross-examine.

Wm. Steell Jackson, Solicitor for Defendants.

To Cyrus N. Anderson, Esq., Solicitor for Plaintiffs, 1011 Chestnut Street, Philadelphia, Pa.

This twenty-eighth day of November, 1921, I acknowledge service of the above notice of taking testimony and receipt of a copy thereof.

Cyrus N. Anderson, Solicitor for Plaintiffs.

[fol. 2] New York, November 30, 1921—10 a. m.

Depositon of C. W. Ellis, taken in sur-rebuttal, on behalf of the defendants, at the office of Gillford & Bull, No. 141 Broadway, New York City, pursuant to the annexed notice, before C. E. Davidson, a notary public.

Present: Thomas H. Sheridan, Esq., on behalf of defendants; Cyrus N. Anderson, Esq., on behalf of plaintiffs.

Q. 1. Give your name, age, residence and occupation?

A. Charles W. Ellis; age 49; 278 Magnolia Avenue, Jersey City, N. J.; occupation, salesman.

Q. 2. Were you ever associated with Concrete Appliances Company, complainants in this case?

A. Yes.

Q. 3. When were you associated with this company?

A. I went with this company in the spring of 1910 and stayed with them until the fall of 1912.

Q. 4. What was the nature of your occupation?

A. I was engaged as a sort of a managing engineer to get together the different vague ideas of the gravity system which several of their foremen had, and then I was used as promoter and salesman in putting this system on the market, in introducing the G Y system of distributing concrete in building construction by gravity. This was handled by shooting the concrete through pipes and afterwards through open troughs.

Q. 5. I call to your attention catalogue of complainant company. [fol. 3] Defendant's Exhibit 59, and ask you if this is the structure which you have mentioned?

A. Yes.

Mr. Anderson: This line of examination is objected to for the reason that it does not appear to be sur-rebuttal testimony or even leading to sur-rebuttal testimony, and furthermore is entirely without the scope of the motion for leave on the part of the defendants to take sur-

rebuttal testimony, in support of which the deposition of this witness is being taken.

Q. 6. Did you have anything to do with the preparation of this catalogue?

Mr. Anderson: Objected to for the same reason as above noted, and as immaterial and irrelevant.

It is agreed that counsel for plaintiff may reserve his objections to questions of this character until some later period during the examination of the witness after this line of examination has been completed.

A. I am personally responsible for the making and issue of this catalogue.

Q. 7. I hand you herewith a copy of patent to Callahan 948,719, and of patent to Emtman, 948,723, and ask you if you know or have known the inventors thereof?

A. Yes. I was acquainted with Mr. Callahan, who was a sub-foreman of the F. O. Engstrum Company and Mr. Emtman was a general foreman.

Q. 8. Was there any relation between the Engstrum Company and the Concrete Appliances Company?

A. The Concrete Appliances Company was practically a subsidiary of the Engstrum Company, all bills were paid by the Engstrum Company.

[fol. 4] Q. 9. What was the business of the Engstrum Company?

A. General contractors, specializing in reinforced concrete construction.

Q. 10. What officers or executives of these companies were you in contact with?

A. I was in contact with Mr. Hugh Bryson and reported to him directly and to no one else, although Mr. Fred Engstrum occasionally would have conferences with me relative to the general situation, as well as Mr. F. O. Engstrum, senior. He died recently.

Q. 11. What do you mean by "general situation"?

A. They were always interested to know what the attitude of the other contractors was toward the Concrete Appliances Company.

Q. 12. What was Mr. Bryson's position with these companies?

A. I believe he was general manager of the F. O. Engstrum Company. He had some office with the Concrete Appliances Company.

Q. 13. What authority did Mr. Bryson have with respect to this gravity system?

A. As far as I was concerned, he had the final say with regard to the policy and decision in all matters.

Q. 14. Did he have anything to do with the patent matters of the company?

A. He was always extremely interested in all patent debates and information.

Q. 15. Did he ever discuss the patentability of this gravity system with you?

A. Yes, he discussed it, but he left this practically up to Mr. Hackley, of Townsend, Lyman & Hackley, who is now deceased, I believe, and myself.

Q. 16. Did you ever have occasion to investigate prior uses of a similar structure?

[fol. 5] A. Yes.

Q. 17. Please explain your answer more fully?

A. As is quite natural, being a promoter, I was instructed and always had my eyes open, when I was travelling around the country for anything which might show priority use.

Q. 18. Did you come across any structures which you considered to be prior uses? By structures I mean apparatus for concrete distribution.

A. Yes, I ran across two claims of priority, one by the Healy-Tibbitts Company of San Francisco, and the Great Lakes Engineering Company, Chicago.

Q. 19. Please explain the circumstances attending this Healy-Tibbitts prior use?

A. I ran into the Healy-Tibbitts proposition on one of my visits to San Francisco when I was soliciting business for the Concrete Appliances Company.

Q. 20. Please explain fully the facts of this location of the Healy-Tibbitts prior use?

A. The engineer of the Healy-Tibbitts Company at that time informed me that they had been using this method of distributing concrete in the construction of docks on some Government work prior to the San Francisco fire or earthquake and used it very extensively after the earthquake on the rebuilding and repairing of docks which were destroyed.

Mr. Anderson: This answer is objected to because it, obviously, is based entirely upon hearsay and must of necessity be incompetent. Furthermore, the examination of this witness with respect to the alleged prior Healy-Tibbitts Company's use is objected to because it would seem to be perfectly apparent that this witness can know nothing of his own knowledge with respect to such alleged prior use.

(Witness continues:) To further prove that he was not comment-
[fol. 6] ing upon his ideas of what constituted a gravity system, he gave me the address of a barge which was then tied up at a dock as they were not using the same. I went down and looked this apparatus over and found that it embodied the general features of the G Y system, the barge having a tower of about thirty feet, a concrete hoist, hopper, and about twenty feet of pipe which was so attached that it could be swiveled from the discharge end of the hopper, together with other apparatus which was not assembled.

Q. 21. Did you make any drawings or other illustrations of this structure?

A. No, at that time I took a photograph of the structure and wrote the company the situation.

Q. 22. Did you discuss this prior use with Mr. Bryson or others of your company?

A. Yes, I went over the situation with Mr. Bryson and Mr. Emtman.

Q. 23. What was the attitude of Mr. Bryson with reference to this Healy-Tibbitts apparatus?

By Mr. Anderson: Objected to as irrelevant and immaterial.

A. He, as well as the rest of us, did not see at that time that it had a direct bearing on building construction.

Q. 24. Did he recognize that the structural features of this Healy-Tibbitts apparatus were similar to those of your gravity system, ignoring the possible difference in application, as between marine—such as dock work—and building construction?

By Mr. Anderson: Objected to as incompetent because it would seem to be apparent that this witness is not in a position to express an opinion as to what might have been or might not have been recognized by Mr. Bryson.

A. Yes, I believe he did.

[fol. 7] Q. 25. During your association with the Concrete Appliances Company did they, to your knowledge, sell any gravity system to the Healy-Tibbitts Company?

A. No, they did not.

Q. 26. Would you presumably have known of such sales had they been made?

A. Yes.

Q. 27. Did your company, to your knowledge, license Healy-Tibbitts Company to use their apparatus?

A. No.

Q. 28. I call your attention to the Callahan & Emtman patents previously shown you, and ask you if either illustrates the structure being sold or used by the Concrete Appliances of Engstrum Company?

By Mr. Anderson: Objected to as incompetent and immaterial, and as not sur-rebuttal.

A. Fundamentally they cover the apparatus, but not in detail. During my connection with the Concrete Appliances Company the apparatus used varied in detail from what is shown in these patents.

Q. 29. Ignoring the details of construction, which of these two patents illustrates the construction utilized by your company during your employment?

A. The patent of Theodore Emtman.

Q. 30. Was the structure shown in the Callahan patent utilized during your employment?

A. No.

By Mr. Anderson: Question and answer objected to as being incompetent in that it calls for an expression of opinion of the witness, and he has not been qualified as a witness competent of expressing such opinion.

Q. 31. Did you have any engineering education or experience before your association with Concrete Appliances Company.

A. Yes, I graduated at the University of Michigan in mechanical [fol. 8] and electrical engineering. Have had extended experience in the designing of engineering apparatus used in construction work, such as concrete pile engineering and concrete block construction.

Q. 32. Was any difficulty experienced in the use of the gravity system during your association with this company?

A. Yes, naturally. We experienced all the troubles which a new industry goes through in the process of evolution, such for instance, as the falling down of towers, the breaking of booms, congestion and uselessness of pipes, and the eventual success of the open trough.

Q. 33. Was the adoption of the open trough during your association with the company?

A. Yes, sir.

Q. 34. Can you give the year, or approximate time of this adoption, or the job?

A. It was while I was in Chicago in consultation with the Witherspoon-Englar Company, due to the failure of several jobs which they were operating on the closed pipe, that I received the wire from Los Angeles that Mr. Snooks, foreman at that time on the—I believe—the Timpkin Building at San Diego, had overcome this congestion by converting his pipes into troughs.

Q. 35. During your association with this company were there any instances of adoption of similar apparatus by parties not purchasing from your company or recognizing their rights?

A. Yes, the Fellowes Construction Company, I believe, construction a pre-cooling plant at Barstow, California, used our apparatus, or rather our system, but did not buy the apparatus from us, or did not lease from us the use of the system.

Q. 36. Was any prosecution made of this company?

[fol. 9] A. No.

Q. 37. Were there any instances during your employment of purchase or lease of its apparatus which was rejected or removed on account of dissatisfaction or failure?

A. Yes.

By Mr. Anderson: Protest is made against this entire line of examination because it clearly is not sur-rebuttal testimony, but on the contrary relates to matter which should have been introduced, if at all, by the defendants prior to the trial of this suit and within the period during which they took their original testimony, and because this appears to be an attempt practically to re-open the entire case.

Q. 38. Please specify, if you recollect, any such instances?

A. There were several instances during the evolution of this system where we had secured leases, but due to failure of detail construction the apparatus was a failure, and naturally we were not in a position to exact payment for the same. One such job was the Hess job in Los Angeles, as I recall it. Another one was on the leading hotel at Fresno.

Q. 39. Was Fred Engstrum, to your knowledge, traveling about and in contact with the various jobs utilizing this gravity system?

By Mr. Anderson: Objected to as immaterial.

A. Only in Los Angeles.

Q. 40. Can you approximate the dates when this catalogue was prepared and published?

A. In the year 1910, I think it was the fall. The dates of the testimonials there show 1910 and they were taken or secured at the time for the issuing of the catalogue.

[fol. 10] Q. 41. In your answer to Q. 4 you answered that you were engaged to get together the different vague ideas that the various foremen had with respect to this gravity system. Did you have anything to do with the design of the apparatus in this connection?

By Mr. Anderson: Objected to as immaterial.

A. Yes, I worked with Emtman and also consulted the different sub-foremen as to any objections they might have to the existing apparatus, with the idea of improvement. I personally did all the detail in the drafting and designing of the aparatus for the same.

Q. 42. Do you remember the year in which you located this Healy-Tibbitts prior use?

A. I think it was the spring or summer of 1911.

Q. 43. I hand you herewith drawings and blueprints of Defendants' Exhibit 41, and ask you if you recognize the same?

A. Yes, these were all made by me with the exception of the sheet entitled "Filtration plant, Grand Rapids, Mich.," which is signed "CNS of January 11, 1911."

Q. 44. Is there any notation or inscription on these prints or drawings which identifies them as having been made by you?

By Mr. Anderson: Objected to as immaterial.

A. These drawings are all signed by me with my initials and are also my own handwork.

Q. 45. What was your practice as to dating such drawings—that is, were they dated when you made them or——

A. They were dated the day of making them.

Q. 46. Were you familiar with the William B. Hough Company?

[fol. 11] By Mr. Anderson: Objected to as immaterial.

A. Yes.

Q. 47. Did you have any contact with this Hough Company?

A. Yes, I practically selected the Hough Company.

Q. 48. Did the Hough Company meet with difficulty in the handling of this gravity system?

A. Yes. As above referred to, on the Sweetwater job of the Whitherspoon-Engel Company, and on several other jobs.

Q. 49. Where was the Sweetwater job?

A. At Sweetwater, Texas.

Q. 50. Did you have anything to do with this Sweetwater job?
A. I was sent down there due to trouble they were having on the pipes, that is all. That was handled by the Hough Company, the layout and everything was made by the Hough Company.
Q. 51. Was the apparatus at Sweetwater retained or discarded?

By Mr. Anderson: Objected to as immaterial.

A. I believe it was discarded.
Q. 52. What was the financial condition of the Engstrum Company at the time of your association with them?

By Mr. Anderson: Same objection.

A. A-1, Bradstreet. They were doing about two and a half million dollars a year contracting work.

(Direct examination closed.)

By Mr. Anderson: In accordance with previous understanding, which will be found above, objection is now made to this entire examination for the principal reason that it is in no way proper sur-rebuttal testimony, and has little or no bearing upon the par-
[fol. 12] ticular matters referred to in the affidavit of George B. Jones, Esq., in support of the motion for leave, on the part of the defendant, to take sur-rebuttal testimony, which motion was heard in the District Court in Philadelphia, Monday, November the 28th.
(Objection is further made on the ground that the testimony of the witness is irrelevant and immaterial.)
(Objection is further made to the preamble to this deposition on the ground that it purports to be taken in sur-rebuttal, whereas leave was given by the Court only to take it in support of the motion for leave to take sur-rebuttal.)
(Notice is now given that at or before the rehearing upon the motion for leave to take sur-rebuttal testimony, motion will be made to strike this deposition from the record.)

Cross-examination by Mr. Anderson without waiving the objections to the testimony as given, or the protest to the taking of the same.

By Mr. Sheridan: It is noted on the record that the deposition of this witness has been given under oath and notice is hereby given that such deposition will be relied upon with the same force and effect as if made in the form of an affidavit in support of motion to take sur-rebuttal testimony and the permission of the Court will be asked to utilize this testimony as sur-rebuttal, if such permission is granted in order to minimize the cost so far as possible.

X Q. 53. Other than the Exhibits No. 41 and 59, have you referred to any written memoranda or data in connection with or in support of the testimony above given by you?
[fol. 13] A. Yes, I have recently gone over some of the testimonies that have been given by some of the other witnesses.

X Q. 54. But that was prior to the beginning of your testimony this morning?

A. Yes.

X Q. 55. You have not referred to or consulted any written original memoranda of your own, have you?

A. No.

X Q. 56. Then, for the most part, your testimony today is based entirely upon recollection?

A. Yes, with two exceptions. I looked up last night and found a couple of receipts and the record of the approximate time of my employment with the Concrete Appliances Company.

X Q. 57. I think you said that on the barge which you saw in San Francisco, the tower was about thirty feet high. And the pipe or chute about twenty feet long, I believe you said. Was that barge and tower in use at that time?

A. No.

X Q. 58. Did it appear as though recently used?

A. It had not been recently used—I could not judge the time.

X Q. 59. Was that in 1911 or 1912?

A. That was in 1911.

X Q. 60. What time?

A. I believe it was in the spring or summer, as near as I can remember.

X Q. 61. While you were with the Concrete Appliances Company do you know whether or not that company had licensees who were operating under its patents?

A. Yes.

X Q. 62. Do you know who some of those licensees were?

[fol. 14] A. Arthur S. Bent Company, who rebuilt the Sweetwater Dam at Sweetwater, California, was one, and the Washington Water Power Company at Spokane, Wash., was another. There were several others but I don't recall their names.

X Q. 63. The Parrott Company was a licensee?

A. They were our agents.

X Q. 64. As I understand it, you knew nothing of that barge and the tower with the chute on it, except what you saw when you visited it during the period of our employment by the Concrete Appliances Company.

A. That is correct, only the word of the engineer of the Healy-Tibbitts Company.

X Q. 65. And as far as you know, the tower and chute which you saw may never have been used?

A. I never saw it in actual operation, the conditions showed use, however.

X Q. 66. Do you recall how that pipe or chute was supported?

A. Not definitely, no. I would not know unless I had seen it in actual operation how it was supported.

X Q. 67. And you don't recall the construction of that pipe either, do you?

A. I paid no attention to any detail, as at that time I was only interested in the general principles of the proposition.

X Q. 68. And if the apparatus which you saw at that time had been previously used, you have no knowledge as to how or for what it was used, is this not so?

A. Yes, the engineer of the Healy-Tibbitts Company told me that this apparatus had been used and was especially efficient in the pouring of the concrete for the floor of the docks, I distinctly recall this point for the reason that I was extremely interested in finding [fol. 15] out how they constructed their cribbing over the water for the placing of steel and pouring of the concrete.

By Mr. Anderson: Answer objected to as hearsay.

(Recess until 1 p. m.)

X Q. 69. In the years 1910 and 1911 while you were with the Concrete Appliances Company, that company was putting out this gravity distributing concrete apparatus, was it not?

A. Yes.

X Q. 70. And, as far as you know, had been putting it out for a period prior to the time that you went into its employ, had it not?

By Mr. Sheridan: Objected to as calling for hearsay evidence.

A. No, all licenses issued were after my connection with the Concrete Appliances Company.

X Q. 71. Is it not possible that apparatus of the character in question could have been furnished to the Healy-Tibbitts Company by the Parrott Company without your knowledge?

A. Possible, but not probable, because the record of all sales and inquiries were sent to me personally for correction and passing.

X Q. 72. Are you prepared to say that the Parrott Company might not have furnished the Healy-Tibbitts Company in the year 1910 with the drawings and specifications of such apparatus?

A. They could not have done this without violation of our contract with them as our agents.

X Q. 73. Do you mean that even if the Parrott Company had had in its possession drawings and specifications furnished by Concrete Appliances Company, it could not have turned them over to the Healy-Tibbitts Company?

[fol. 16] A. Such a thing is possible, I don't see that it was necessary, for the reason that we had been advertising in detail the construction of the G Y system in the Engineering News and the Architect & Engineer, a magazine published in San Francisco.

X Q. 74. As far as you know, that tower and chute which you saw on the barge in San Francisco in 1911, if used at all, might have been constructed and used in the years 1908 or 1909, might it not?

A. It is possible.

X Q. 75. Do you know when that Sweetwater, Texas apparatus was used that you referred to a while ago?

A. I think that was in 1911—I am not positive of that.

X Q. 76. You said that apparatus was discarded, why was it discarded?

A. Due to failure of detail of construction, principally due to the attempts to use pipes instead of troughs.

(Cross-examination closed.)

Redirect examination by Mr. Sheridan:

R. D. Q. 77. In cross-examination you have referred to royalties paid by several companies to Concrete Appliances Company. Have you any knowledge or recollection as to the amounts of these royalties?

A. At the start we attempted to tax the users at the rate of seven cents per yard for every cubic yard that went through the apparatus. We also sold them the apparatus and charged them with the services of a competent foreman to run the same.

R. D. Q. 78. You say you attempted to tax the users. Am I to understand that this attempt was discontinued?

[fol. 17] A. It always ended in a compromise. We never refusing to take what was offered.

R. D. Q. 79. What was the minimum, so far as you recollect, accepted by the Concrete Appliances?

A. I cannot definitely answer this question. I believe, however, on one case, on the Washington Water Power dam job, at Spokane, our royalty amounted to something like $70,000 and we settled for something around $15,000. This rate was afterwards reduced to two cents a cubic yard.

By Mr. Anderson: All this line of examination is objected to as immaterial.

R. D. Q. 80. Were there any instances in your recollection when the company waived a claim to any royalty whatsoever?

By Mr. Anderson: Objection repeated.

A. In most all the early cases which were failures we made no charge.

R. D. Q. 81. Did you consent to testify today willingly or unwillingly?

A. Unwillingly.

R. D. Q. 82. Have you any interest financial or otherwise in the outcome of this controversy?

A. None whatever.

(Re-direct examination closed.)

Recross-examination (without waiving objections):

R. X Q. 83. In all cases while you were in the employ of the Concrete Appliances Company where the jobs were successful, that company did receive royalties, did it not?

A. I believe there were one or two cases where they did not receive royalties, but we always secured a written acknowledgment of the contract which was a recognition of the patents.

(Examination of witness closed.) Charles W. Ellis.

[fol. 18] NOTARIAL CERTIFICATE

STATE OF NEW YORK,
City and County of New York, ss:

I, C. E. Davidson, a notary public, in and for the County and State of New York, do hereby certify that pursuant to the annexed notice in the above-named cause, I was attended at the offices of Messrs. Gifford & Bull, No. 141 Broadway, New York City, by Cyrus N. Anderson, Esq., counsel for the plaintiffs, and by Thomas H. Sheridan, Esq., on behalf of the defendants, on the thirtieth day of November 1921, at 10 o'clock A. M.; that the aforenamed witness, Charles W. Ellis, who was of sound mind and lawful age, was by me duly sworn to testify the truth, the whole truth and nothing but the truth, and thereupon testified as is above set forth; that the deposition subscribed by the witness as above set forth was by me reduced to writing in the presence of said witness himself and from his statements, and was subscribed by said witness, and was taken at the place in the annexed notice specified, and was done in the presence or with the consent of said counsel for plaintiffs and defendants.

I further certify that I am neither of counsel nor attorney to either of the parties to said suit, nor interested in the event of said cause.

Witness my hand and seal this thirtieth day of November, 1921.

C. E. Davidson, Notary Public, No. 16, New York County.
My commission expires March 30, 1922. (Seal.)

[fol. 19] Philadelphia, Pa., Tuesday, October 4, 1921—10 a. m.

Present: Parties as before noted.

DEFENDANTS' EVIDENCE IN OPEN COURT

Mr. Jones: Defendants now offer in evidence the depositions heretofore taken and the exhibits identified in the printed record of said depositions

Defendants also offer in evidence as Exhibit No. 66 the bound folder of copies of the patents set up in the answer.

Mr. Hood: Plaintiffs renew the objections entered in the printed record referred to.

Counsel for plaintiffs note that Exhibit 64 as offered does not correspond to the said exhibit as presented to counsel for plaintiff for approval prior to the stipulation which has been entered of record with reference thereto on page 696 of defendants' printed record, and said stipulation is hereby withdrawn as to the following portions of Exhibit No. 64.

"Concrete and reinforced concrete construction by Homer A. Reed, 1907, page 108," and

"Michigan Engineer, 1905-1908, concrete mixing and delivery plant, by William G. Fargo," and

A photostatic reproduction of a page, 187, headed "Practical Construction," and bearing an illustration, "Fig. 260," purporting to be from a book by one Marsh.

These three portions of Exhibit 64 are objected to on the ground that they have not been properly proven.

[fol. 20] Counsel for plaintiffs state, however, that if prior to the filing of brief by the plaintiffs in this case, he can be reasonably satisfied as to the correctness of the portions objected to, and the dates which they purport to bear, he will agree that the objection just entered may be withdrawn.

JOHN R. WILLIAMS, having been duly sworn, was examined and testified as follows on behalf of the defendants:

By Mr. Jones:

Q. 1. Please state your name, age, residence and occupation.

A. John R. Williams, age 48. Manager of the Atlantic Division of the Great Lakes Dredge & Dock Company, with headquarters at New York City.

Q. 2. How long have you been connected with that company?

A. Since early in the year 1906.

Q. 3. Please outline the character of the work carried on by that company, and the scope and nature of its activities.

A. We operate all over the Great Lakes, and between there and the Atlantic Coast, and on the Atlantic Coast, even as far as Philadelphia and Boston, but the construction work is confined largely to the Great Lakes, although we are doing and have done considerable on the Hudson River.

Q. 4. State a little more in detail what kind of work your company does.

A. We do all kinds of construction work, harbor improvements, foundation work, tunnel work, dry docks, anything of a construction nature; bridge work.

[fol. 21] Q. 5. Can you give some idea of the financial magnitude of your annual operations?

A. Well, our gross operations would run anywhere from eight to twelve million dollars annually.

Q. 6. Does this work you have referred to involve the placing of concrete?

A. To a very large extent.

Q. 7. Are you familiar with any instance of the use of chutes for distributing concrete in your work?

A. Yes, I am. In about May, 1906, the United States Steel Corporation started the development of the Gary Steel Plant on Lake Michigan south of Chicago. This was to be about a one hundred million dollar improvement, and our people early in July acquired the contract for the entire harbor, together with the pumping station and intakes, as well as water tunnels and the like of that. They made a start on this harbor development and pumping station and intake in the latter part of June.

Q. 8. What year?

A. Nineteen hundred and six, or early in July. I think they acquired the contract around the first of July. However, I was down there in an assisting capacity in getting the equipment in the forepart of July. In the latter part of July, I think around the 24th, I was sent down there in charge as general superintendent of all work we had there, which amounted to around two and a half million dollars at that time, which was afterwards increased considerably. One of the first units to be put in, and of necessity crowed, was the pumping station and intake, because of the fact, as soon as the development of the plant had reached any magnitude, they would have to have the water for the plant service, and this pumping station was of considerable size, suitable for serving, I believe, twelve blast [fol. 22] furnaces, which was a large unit. We made a start on the pumping station early in July, 1906, by putting in a coffer-dam, and when I arrived on the field it was under way, but not completed—that is, the coffer-dam. This work was crowed, and along in November I should say, of the year 1906 we reached the point of concreting in this pumping station.

I might describe the pumping station a little. It was a coffer-dam about thirty feet in width, that is, the deep part, by 100 feet in length, and went down to 24 feet below mean low water. I am going into these details because I want to tie in the fact of the location of the mixer and the method used. I want to establish the fact that the mixer was located probably forty feet above our lowest point of deposit of concrete, and immediately alongside of the coffer-dam excavation. The walls of this sub-structure were of considerable dimensions as to width, and of necessity a full height of ultimately forty-odd feet, and the mixed being placed up alongside, it permitted us to use chutes for depositing same, but to use the chutes it also necessitated using quite wet concrete, and we had quite a strong and continued fight on the feature of using wet concrete, which permitted us to use the chutes, as the engineer in charge, or I should say, the general superintendent in charge, as many were at that time, was very much against wet concrete. The wet concrete helped us in other ways because of the numerous bracings in the coffer-dam, it was quite difficult and took quite a little time to change the set-up of our mixer, as the whole affair would have to be raised up and moved over into different bays between the bracing. The mixer was a Smith batch mixer on a small car that went on a standard gauge railroad track immediately alongside of the excavation on the trestle. [fol. 23] In front of this and beneath the outlet of the mixer was a triangular shaped trough or chute built of plank. So that when the mixer was emptied or rolled over to empty, it would deposit the concrete in this chute. At the end of this chute, which was drawn together, were suspended our metal chutes, which extended from that point down into the coffer-dam area. Sometimes there were one, two and three chutes, and the long ends of them were suspended, either resting on the bracing or suspended from the bracing. Sometimes timber was put under them to help hold them up. Then at the end of the straight portion of the chute, another chute would

be laid under that to take the concrete sidewise in directions other than straight away from the mixer.

That work on the pumping station proper was completed, I believe, soon after the first of the year 1907.

However, in March, 1907, we were starting the intake section, which was two concrete tunnels extending from the pumping station, approximately 700 feet toward the location of the slip we were to dig in from the lake. The bottom of these two tunnels was about 22 feet below datum, and the ground elevation along this point, the same as at the pumping station, was about 20 feet above datum, indicating the height at which our mixing plant would stand with reference to the tunnels. The same mixer rig was transferred around to the side of the tunnels, which went at right angles to the long axis of the coffer-dam, and for the first week or two, due to the difficulty we had in getting in the first section of the tunnels as it left the pumping station, practically the same rig was used as in the pumping station proper, that is, the mixer rig, but due to the necessity of standing the mixing rig back away from the excavation, due to the slope of the banks at the side, as our sheathing only [fol. 24] came up about four feet above datum, we had to reach farther with our chutes, and the suspension of the chutes, the method we used in the pumping station, was not satisfactory, and at that time, I should say in April, 1907, about, there was a boom attached to the mixing rig, which could support these chutes, 1, 2, or 3, whatever was required, depending upon the distance the concrete was to be deposited away from the mixer, and this boom was supported from the point to a short mast incorporated in the structure around the mixer, and it was pivoted at the bottom to permit raising or lowering or swinging either way, which would premit the concrete to be deposited out in front on an arc, whatever the particular requirements required at that time. We had practically the same wooden hopper immediately under the concrete mixer, which the mixer dumped in, and then at the outlet of that it was restricted, that is, it flared out over the side in front of the mixer, and was drawn down to possibly twelve inches at the outlet, or a little more, and immediately under that was suspended the upper end of the chutes. This end was usually suspended by means of a short A frame that was stepped. The suspension of the upper end of this chute was partially from this short A frame that stood in front of the mixer, and somewhat to one side of the center of the pump, and the lower part of the chutes, which would be never less than two sections of the chute, would be suspended from the point of the boom by means of a fall and tackle. The upper end of the upper chute section was somewhat flared out to assist in preventing the concrete when the chute was led off to an angle from over-running as it came out of the wooden hopper. When there were three or more lengths of metal chute used, the end of the third chute toward the mixer would also be suspended from the end of the boom by means of slinging it [fol. 25] from the lower end of the second chute section. In other words, it was a continuous chute, except it had an angle, and did not lead straight from the main chute.

Q. 9. Who was credited as the designer or proposer of this rig you have just described involving chutes and a boom?

A. I should say it was the outcome of our organization, although probably Mr. Cameron, who was then our concrete superintendent, had as much, if not more, than anyone else to do with it.

Q. 10. You referred to a general superintendent as being opposed to wet concrete. Was that your general superintendent?

A. No, that was Mr. Gleason, who was in charge of the construction of the Gary Steel Plant for the Steel Corporation. He was in entire charge of the whole development and is at the present time.

Q. 11. I call your attention to Defendants' Exhibit No. 17, "Great Lakes Dredge & Dock Company's Photographs," and will ask if you can identify any of the views shown therein, briefly.

Mr. Hood: Counsel for plaintiffs object to a reference to any of these photographs which bear date subsequent to the date of the particular application on which the patent in suit was issued, that date being January 21, 1909. It seems to me a reference to these subsequent devices is wholly immaterial.

(Testimony taken subject to the objection.)

By Mr. Jones:

Q. 12. Proceed.

A. "A" is a photograph showing the mixer I have just described used in connection with the building of intake sections, and this shows it at a point approximately half way down the intake section. It is not complete there, as it had been partially dismantled to be moved into this position.

[fol. 26] "B" shows a floating mixer plant that we constructed a little later, I think in 1908, for use in connection with the building of the turning basin concrete docks and the coke oven pumping station. This rig was substantially the same and was copied after the mixer rig that I have described previously.

"C" is a tower rig that I have seen on the Iroquois Iron Company's plant at South Chicago used by our people in the building of that plant.

"D" is another view of this same Iroquois plant showing a tower mixing rig for depositing concrete through chutes, which I saw there.

"E" is another view of the same plant showing a floating mixer rig used for concreting the ore dock along the slip at the Iroquois Iron Company's plant.

"F" is a rig I am not familiar with as having seen.

"G" is another rig that I am not familiar with.

"H" is a rig that I am not familiar with except by reputation.

"I" is another one of the same.

"J" is also another one.

"K" is the first rig we used in 1906, which I described at the beginning of my testimony in connection with the pumping station sub-structure.

"L" is the same rig when it was first moved, and before the boom

was installed and set up at the beginning of the intake sections. This is all that Gary plant construction.

"M" is the same rig as improved with the boom which I more particularly described in my previous answer.

Q. 13. Who was responsible for the development of these successive devices which followed the 1906-1907 apparatus?

A. You mean at the Gary plant?

Q. 14. Yes.

[fol. 27] A. Our organization, those in charge of our operations, I should say. It was purely a Great Lakes development.

Q. 15. You mean no one particular man?

A. I could not say that there was, no. It was the effort of all studying out the conditions that we had. Our general manager, Mr. Lutz, perhaps suggested as many things as any one else. It was a composite affair.

Q. 16. You have referred, I believe, to offices in other cities besides Chicago?

A. Yes, we have eight different divisions, and while I did not see all of the other plant of this nature in operation, I was in touch with every building and operation through the intercourse I would have with other members of our organization, as we were going back and forth, and then we also have a weekly publication by the manager of each division in which is noted the developments during the previous week, whatever of interest came up like constructing a new plant, the operation of a new plant, and in that way I have followed more or less the development of the different points, although I have not seen all of them, and there were no instances where this tower mixer, either on land or water, were started on a job but what they went through and were completed as outlined. Of course, they have been perfected and changed to suit different condtions.

Q. 17. You mean the concrete work went through and was completed?

A. Yes. We found mixer rigs that we have developed that practically started from those that we had at Gary.

Q. 18. Since June of 1907 for about how many years have you used a concrete distributing apparatus comprising chutes hung from a boom which could swing from side to side?

A. We are still using them.

[fol. 28] Q. 19. How continuously have you used them during that period of time?

A. Practically all of that time. Of course there would be intervals when one plant might be idle for a few months. Of course on the lakes, in the winter season, they are not used on account of the freeze-up.

Q. 20. Are you or is your company financially interested or otherwise interested in the outcome of this suit?

A. In no way whatever except in the general benefit to all contractors.

Cross-examination by Mr. Hood:

X Q. 21. Your company at the present time and for some years since 1910 has used plants like those shown in some of the photographs of Exhibit 17 in which the boom and hopper could be vertically adjusted on the tower and in which the boom carried a chute section which had its upper end pivoted to the hopper and its lower end suspended from the boom. That is correct, is it not?

A. Yes, sir.

X Q. 22. So that if this patent is valid, your company would be an infringer?

(Objected to.)

A. Well, I am not a lawyer. I don't know as to that.

FRED BRUNER, having been duly sworn, was examined and testified as follows:

By Mr. Jones:

Q. 1. Please state your name, age, residence and occupation.

A. Fred Bruner. Age, 41. Vice-president and general manager of the Pihl & Miller Company, Pittsburgh.

[fol. 29] Q. 2. Have you had any experience in placing concrete?

A. Considerable.

Q. 3. Since what date?

A. When I left school in the spring of 1910 I went to Chicago and was employed by the William B. Hough Company, sales representative of concrete machinery, and I had obtained considerable experience associating with contractors, and directing the placing of reenforcing steel in various buildings, and in the fall of 1910 we, that is, the company, took the agency of the Concrete Appliances Company of Los Angeles for a system of placing concrete, using booms and troughs, and so forth. At this time we did not know a great deal about this, but from sketches and so on, drew up plans, and had material manufactured, consisting of pans, swivels, pipes, and so forth. Then we proceeded to introduce this material on a sales proposition and a royalty for the use of the idea.

The first operation that I had any experience with was the W. J. Newman Company of Chicago, for placing the concrete in the caissons, I believe at the Insurance Exchange Building foundation. I supervised the erection of the tower, the construction of the boom and the general rigging up of the plant, but owing to the fact that we were not so sure about our knowledge of the operation of this apparatus, the Concrete Appliances Company sent on Mr. Theodore Emtman of Los Angeles to give this plant a final inspection. This was done by Mr. Emtman, and the plant was practically O. K'd, and they proceeded to attempt to operate it. The operation was never successful to the architects and engineers, nor to the contractor; owing to the difficulty with the pipes clogging, and a general inexperience with

the plant practically. At this time Mr. Emtman, however, said that he had operated similar plants in Los Angeles with absolutely no [fol. 30] trouble, and had practically developed the entire apparatus, and had anticipated getting some patents, but discovered that——

Mr. Hood: I object to statements that Mr. Emtman may have made in matters of that kind as wholly immaterial and hearsay. The defendants in this case had Mr. Emtman as their witness, and did not examine him on that subject at all.

Mr. Jones: We had Mr. Emtman examined as well as we could on everything, but he did not remember anything.

Mr. Hood: No questions were asked about an alleged conversation in Chicago with this witness or with anybody else.

(Testimony taken subject to the objection.)

By Mr. Jones:

Q. 4. Proceed, then.

A. (Continuing:) But discovered that some other people had secured patents ahead of him. Due to this condition it was necessary for him to get together with the other people who had obtained these patents, and the entire bunch were thrown together and assigned to one party. In my opinion, Emtman certainly understood how to handle these things, but for some reason could not make this one in Chicago work.

Mr. Hood: We move to strike out all of the hearsay evidence.

The Court: The testimony now objected to is admitted subject to the objection, which is to be ruled upon along with the other issues in the cause, with leave to the objecting party to move to strike out, which motion is to be considered as if made in support of every objection, and an exception is allowed to the party against whom the final ruling is made, this ruling to apply not only to the examination [fol. 31] of the present witness, but to all of the succeeding witnesses, and to all of the evidence at any time produced in the case, and is also to cover instances of all objections heretofore made.

By Mr. Jones:

Q. 5. What did you learn as to who was responsible for the development of the main features of this apparatus which you were attempting to license?

A. Theodore Emtman.

Mr. Hood: That is objected to as hearsay.

The Witness: Well, he said he was.

By Mr. Jones:

Q. 6. Was the concrete work on this Newman job completed with this apparatus?

A. No. These pipes clogged up, and gave so much trouble, that too many caissons were open, and no concrete placed in them, so that

Newman was practically forced by the architect to abandon this method and fill the caissons by the previous method of carts.

Q. 7. Were any licenses, or license fees, paid, or was any other payment made for this apparatus?

A. I do not know. That would be handled in the office.

Q. 8. What was the next job you were connected with?

A. The next job of any importance that I was on was Dry Dock No. 4 in the Brooklyn Navy Yard.

Q. 9. If an apparatus of this type was used there, please describe it, and the circumstances.

A. After the failure or the practical failure of the Newman job we decided that pipes were not the proper method of conveying concrete. So we designed the pans and swivel joints, and made them applicable to an open trough. This open trough system was the materail that was shipped to the Brooklyn Navy Yard.

[fol. 32] Q. 10. What was the approximate date of the Newman job and of the Navy Yard job?

A. The Newman job was in the fall of 1910, and I went to the Navy Yard in the latter part of April or May of 1911.

Q. 11. Did the apparatus work at the Navy Yard?

A. It worked better than at the Newman job, but still was not satisfactory, the principal reason being the sagging of the chutes, causing them to clog up, and the entire slowness of the process of placing concrete from this tower.

Q. 12. What can you say with reference to the cost of such placement?

A. Well, of course, the way these things were sold, they were sold on a royalty basis, of so much per yard.

Q. 13. How much?

A. Ten cents per yard. The person selling the apparatus had to be able to convince the contractor that he could place his concrete with a much smaller crew and, of course, effect a saving considerably over the ten cent royalty.

Q. 14. How did this work out?

A. On these two jobs it did not work at all. At the Brooklyn Navy Yard we placed about between five and six hundred yards of concrete through this apparatus at a cost of about $6000.

Q. 15. And then what happened?

A. It was taken down and moved.

Q. 16. How was the rest of the concrete placed?

A. Before we put this plant up the concrete was being mixed on the coffer-dam wall at the head of the dock, conveyed completely around the dock on tracks in the two-yard cars, then chuted from the cars to placement anywheres in the dock, and, of course, this concrete placing was going on all the time we were erecting and experimenting with the gravity system.

[fol. 33] Q. 17. Describe briefly the apparatus known as the gravity system?

A. It consisted of a hoist, a tower of suitable height, from which would be either suspended by cable or by a swinging boom, troughs, through which the concrete was to flow to place.

Q. 18. And is this what you have referred to as Emtman's alleged design?

A. Yes.

Q. 19. In the Navy Yard job did you complete your work with your apparatus or discontinue before completion?

A. No, we erected the job complete, according to the layout, prepared to place the concrete from the center of the dock to within about four hundred feet of the ocean end. From that point the gravity system would cover the entire dock lay-out.

Q. 20. Were you paid your royalty?

A. I have not any idea. I don't believe so, however.

Mr. Hood: I move to strike that out as an opinion of the witness.

By Mr. Jones:

Q. 21. Was that $6,000 figure intended to be high or low?

A. In the construction of the plant, the experimentation cost a whole lot more than any one had anticipated.

Q. 22. I just want the Court to understand whether you consider that the $6,000 was an extravagant figure, or a very reasonable figure.

A. No, that was extravagant.

Q. 23. What did you do after the Navy Yard job?

A. After the Navy Yard job I left the William B. Hough Company and went with Parrott Company, of San Francisco, who had taken the agency for the Concrete Appliances Company's material [fol. 34] on the Pacific Coast.

Q. 24. What did you do next?

A. Went to Spokane, Washington, to interview the Washington Water Power Company in reference to using this material on the installation of a hydro-electric department at Long Lake, Washington.

Q. 25. Do you mean this so-called Emtman apparatus?

A. Yes. The Washington Water Power Company were favorably impressed with their investigation, and signed up for a lump sum amount for the services of the erection, engineering and use of this apparatus.

Q. 26. How did the apparatus work on that job?

A. On that job it worked out better than on any other because we had had—that is, I personally had had enough experience by that time to know where the troubles were in the other plants, so that this one was erected safe, and after a few minor troubles, that you would experience in most any comprehensive system, it worked all right.

Q. 27. What year was this?

A. That was probably in the year—it started in 1912.

Q. 28. What did you do next?

A. That was the only real job we did on the Pacific Coast. After several attempts to sign up other jobs, which I was not able to do, because all the contractors stated the lay-out was nice, and it looked good, but they did not feel like paying anyone any royalty for using it. So, therefore, as a general rule, they went ahead and used the

apparatus, and our company would get nothing out of it. I wrote to the main office of the Parrott Company and also to the Concrete Appliances Company about these alleged infringements, but never could get any action, so I resigned and came back east.

[fol. 35] Q. 29. Do I understand that the Parrott Company was the western agent for the Concrete Appliances Company of Los Angles?

A. Yes.

Q. 30. After you came east, what can you say with reference to any possible further use of a similar apparatus by contractors or builders?

A. Practically everybody that had a job where they thought this apparatus would apply were using it. I came to Pittsburgh, and Booth & Flynn, contractors of Pittsburgh, were using an exact duplicate of this material on the approaches to the Manchester Bridge. T. A. Gillespie and Company were using it on dams sixteen and seventeen in the Ohio River. M. J. O'Hara and Company were using it on open cut tunnel. It was being used on several apartment jobs right in Pittsburgh, practically duplicate stuff.

Q. 31. Were royalties being paid?

A. No.

Q. 32. About when was this?

A. Nineteen hundred and thirteen.

Q. 33. Do you know how long the Parrott Company continued to represent the Concrete Appliances Company?

A. No.

Q. 34. Do you know whether they still represent them?

A. I do not.

Q. 35. Was there any publicity given to any of these Pittsburgh jobs you have referred to?

A. Yes, the Booth & Flynn job was very completely written up and photographed, that is, cuts were published in the Engineering News at that time.

Q. 36. When you were in San Francisco did you ever hear of Healy, Tibbitts and Company?

A. I knew them as extensive contractors along the water front [fol. 36] in San Francisco and in Oakland and around.

Q. 37. Did you ever see any of the apparatus they may have used for distributing concrete along the water front?

A. Not that I know of. I did not pay any attention to it if I did.

Q. 38. I call your attention to Exhibits Nos. 41 and 42, and will ask you to state briefly what, if anything, you know about them.

A. Which is this?

Q. 39. Exhibit No. 41.

A. Exhibit No. 41. This sketch marked 40 is a sheet similar to some that were furnished by the Concrete Appliances Company to the William B. Hough Company to detail the material from.

Q. 40. What is the third sheet marked "Gravity system, Wiliam B. Hough Company"?

A. That is a typical layout that we would make for installation for

a specific case. The circles show the radius of the booms, these smaller circles show the radius of the swinging trough at the end of the boom. The big circle shows the entire radius covered by one particular plant.

Q. 41. You mean that the concrete could be deposited at practically any point within the available space of these circles?

A. Anywhere within the available space of these circles.

Q. 42. Was this considered an important feature?

A. Yes, because with the same apparatus, if the concrete could be placed almost instantly from one point to another, that is, the placing of it transferred from one point to another, the whole job could be covered with no moving of the plant.

Exhibit No. 42 is the detail of practically the first apparatus we [fol. 37] had manufactured at Chicago. These drawings, that is, this first one, and most of these drawings, refer to materials that are used in connection with the pipe.

Q. 43. Whose design are they?

A. William B. Hough Company. That is, after the failure of the Newman job, we all held a conference, and made sketches, and changed the apparatus; so that the whole engineering department was responsible for the various changes.

Q. 44. Do you know anything about the apparatus illustrated in Exhibit No. 43?

A. I do not recognize this particular location, but that is the apparatus we were supposed to erect, with the wooden lattice boom, practically horizontal, with the topping lift lines on that boom, and the trough was attached, and the concrete flowed down this trough with a swivel at the end of the boom, and a receiving pan at the junction of the topping lift lines to the tower. This horizontal boom—the principal fault was, when the weight of the concrete caught in the center of the trough, coming from the hopper down to the end of the boom, the end of the boom would raise up, and destroy the slope of the chute toward the end and cause the clogging. So that these woden horses, two of which are shown on Exhibit No. 43, were afterwards installed to prevent this sagging.

Q. 45. Do you refer to the nearly vertical members in the upper picture extending from the lattice boom up to the pipe?

A. Yes.

Q. 46. Did all this apparatus which you have tried to license have the second swivel extension pipe at the outer end?

A. Yes.

[fol. 38] Q. 47. Of the boom?

A. Yes, sir.

Q. 48. That was essential, was it?

A. Yes, sir, in order to get from the end of the boom down to the work.

Cross-examination By Mr. Hood:

X Q. 49. Do you know of your own personal knowledge that no royalties were paid by any of the parties in Pittsburgh whom you say used the apparatus?

A. They all told me they were not paying them and that they have not paid.

X Q. 50. You do not know of your own personal knowledge that they did not?

A. Only what they told me.

Mr. Hood: Counsel for plaintiffs move to strick out the evidence on this point.

The Court: Does he know they used it?

Mr. Hood: Yes, he knows they used it, but he does not know whether they paid for it or not.

By Mr. Hood:

X Q. 51. When did you go to San Francisco?

A. I went to Spokane in the fall of 1911.

X Q. 52. You went from San Francisco to Spokane, did you?

A. No, I went from New York to Spokane.

X Q. 53. When was that?

A. I was in San Francisco then early in 1912.

X Q. 54. And you say you saw some operations on the water front of Healy, Tibbitts & Company?

A. No. I did not see them.

X Q. 55. You did not?

A. No, sir. I said I knew Healy, Tibbitts & Company.

[fol. 39] X Q. 56. What radical changes do you find indicated in Exhibit No. 42 over the structure illustrated in Exhibit No. 41? What radical changes in structure, or general theory of operation, do you find illustrated in Exhibit No. 42 over the instructions which you find in Exhibit No. 41?

A. They are entirely different exhibits, that is, No. 42 is a detail drawing of material used, and No. 41 is a general layout.

X Q. 57. So that Exhibit No. 41 was not intended to be detailed instructions for the construction of the apparatus, was it?

A. Well, it is the detail drawings of the stuff incorporated in the apparatus.

X Q. 58. That is, Exhibit No. 41 contains detailed drawings does it?

A. Yes, sir.

X Q. 59. And Exhibit No. 42 contains detailed drawings also, does it not? This Exhibit No. 42 (indicating).

A. You have got me mixed up. I have got that all mixed up. I thought this was Exhibit No. 41 and that was Exhibit No. 42.

X Q. 60. Now, you have Exhibit No. 41 in your hand.

A. Yes.

X Q. 61. Does that exhibit give any instructions or the detail of construction, of any parts of a concrete chuting apparatus?

A. Yes, these drawings, No. 9 and No. 10, are a detail of the connection between the 7-inch pipes used in the early apparatus, and the sheet with the number and title torn off is a general layout of a complete installation.

X Q. 62. The revised sheet No. 5 of Exhibit No. 42 is substantially identical in the instructions which it gives with the instructions which [fol. 40] you find on these sheets, No. 9 and No. 10 of Exhibit No. 41?

A. Exactly.

X Q. 63. Tell us what radical changes in structure are indicated in Exhibit No. 42 which you have in your hand over the structural details which are illustrated in Exhibit No. 41. There are not any radical changes, are there?

A. Well, now, sheet No. 3 on this Exhibit No. 42 shows the open trough which we used in place of the pipe. I would say that is the only sheet that, to my knowledge, would be any different than what is on Exhibit No. 41.

X Q. 64. While you were with the Hough Company, they did make arrangements with some contractors to use the apparatus which they were licensing to use, and that apparatus was erected and successfully used in building operations. Is not that true?

A. Well, it was used for the completion of the building, but whether the clients were well satisfied I doubt considerably.

Mr. Hood: Counsel for plaintiffs move to strike out all of the preceding answer following, "But whether," as pure surmise, and not responsive.

Redirect examination by Mr. Jones:

R. D. Q. 65. How detailed were the drawings originally furnished you by the Concrete Appliances Company as a basis for your interesting customers?

A. They did not furnish any drawings for specific customers. We made those ourselves. The thing that they furnished was some similar detail to that shown on Exhibit No. 42. Then when Mr. Emtman came to Chicago he, in conjunction with the Hough organi- [fol. 41] zation, completely developed those shown on Exhibit No. 42.

Mr. Jones: I offer in evidence as Exhibit No. 67 a copy of the Smith patent, No. 948,746.

Also Exhibit No. 68, being a certified copy of a skeleton history of the Emtman patent, No. 948,723.

(Defendants close.)

Plaintiffs' Rebuttal in Open Court

Frank I. Ginsberg, having been duly sworn, was examined and testified:

By Mr. Hood:

Q. 1. Please state your name, age, residence and occupation.

A. Frank I. Ginsberg. Age, 36. Residence, 1055 Grand Concourse, New York City. Occupation, plant engineer.

Q. 2. In what were you engaged, and where were you engaged, in the latter half of the year 1906?

A. I was in San Francisco engaged in placing the re-enforcing steel on concrete buildings.

Q. 3. In whose employ were you at that time?

A. Part of the time for Healy, Tibbitts & Company of San Francisco.

Q. 4. How long did you remain in the employ of Healy, Tibbitts & Company?

A. I would say approximately a year.

Q. 5. Beginning when?

A. I would say the latter part of 1906; 1907, possibly.

Q. 6. You had charge of the placing of the reenforcing steel for concrete structures under fabrication by that company during that period, did you?

[fol. 42] A. I did.

Q. 7. Was it part of your duty to visit all of the work of the Healy, Tibbitts & Company going on in San Francisco during that period?

A. No, only on certain jobs where I was employed.

Q. 8. Did you visit the other jobs from time to time during that period, however?

A. I did.

Q. 9. Do you know, or did you know at that time, a man by the name of Charles C. Horton?

A. I did.

Q. 10. Was he the vice-president of Healy, Tibbitts & Company at that time?

A. I don't know.

Q. 11. Did you know a man by the name of Martin E. Brown at that time?

A. I did.

Q. 12. What was his employment at that time?

A. He seemed to have charge of the delivery of material, building supplies, to the various building operations.

Q. 13. Mr. Horton and Mr. Brown have testified on behalf of the defendants in this case that in the spring of 1906 in the fabrication of Piers 42 and 44 on the San Francisco water front there was used an apparatus which is illustrated in this memory sketch, Exhibit No. 61. Those gentlemen have also testified that that same apparatus was used by Healy, Tibbitts & Company in the subsequent fabrication of their reenforced concrete structures for a period of a year or more following the middle of 1906. While you were in the employ of Healy, Tibbitts & Company did you see any such apparatus in use on any of the Healy, Tibbitts & Company jobs?

A. I did not.

[fol. 43] Q. 14. If you had seen such an apparatus would you have remembered it?

A. Undoubtedly.

Q. 15. Were your duties with Healy, Tibbitts & Company of such a character as to bring you in close and intimate association with the appartus which was used for the placing of concrete?

A. Yes.

Q. 16. What was the apparatus commonly and generally used by Healy, Tibbitts & Company in placing concrete during the period of your employment with Healy, Tibbitts & Company?

A. A concrete mixer, a hoisting engine, wooden tower, a bucket or a skip, a floor hopper, from which point the concrete was distributed over the entire floors by means of runways supported on horses or small trestles.

Q. 17. Did Healy, Tibbitts & Company during your period of employment by them make use of any concrete distributing apparatus which involved a swinging boom carried by a hoisting tower and shifted up as the work progressed, and operating as a support for a chute which was connected with the hopper?

A. I cannot recall an instance.

Q. 18. If there had been an instance, would you have recalled it, do you think?

A. Yes, easily.

Q. 19. I call your attention again to Exhibit No. 61. What have you to say as to the probability of the operability of the alleged chute, which is illustrated in that drawing.

Mr. Jones: That is objected to as calling for an opinion on a hypothetical matter, and also as immaterial.

(Testimony taken subject to the objection.)

[fol. 44] A. It is my opinion that the arrangement of chutes that are shown on this plan could not be made to operate practically, due to the fact that unless this chute would have some means of support at either individual section it would sag down and create a trap, much the same as a plumber's trap, and thereby entirely block the flow of concrete through that chute.

Q. 20. That is to say, you understand this drawing to illustrate an inclined pipe, composed of a series of sections, which are connected together by chains and hooks. Is that right?

A. That is right.

Q. 21. Is that what is ordinarily termed a Tremie pipe?

A. Yes.

Q. 22. The connection between the two sections of a Tremie pipe is such as would afford flexibility?

A. That is right.

Q. 23. And I understand you to say that if a Tremie pipe like that shown in Exhibit No. 1 be set at an angle as shown in that exhibit, it would operate as a series of successive traps for the concrete at each junction between each pair of sections, unless some means we provided to tie up each joint, and in that way hold the structure straight?

A. That is correct.

Q. 24. Would it be practically possible to tie up the joints of a Tremie pipe in that way?

A. It may be, but I have never seen it done.

Q. 25. Under what conditions of position is a Tremie pipe useful or operable in the handling of mush concrete?

A. Only where the concrete is deposited vertically through this Tremie chute, or it is used in many cases where the concrete is deposited under water, and it is desired to present the separation of materials which would take place if it was merely dropped into a form, [fol. 45] instead of being lowered through a Tremie chute.

Q. 26. Have you examined this piece of rusty pipe, Exhibit No. 62?

A. Yes.

Q. 27. What is that piece of pipe, or what was it originally?

Mr. Jones: That is objected to, as the witness has testified that he has not seen the alleged apparatus of Healy, Tibbitts & Company.

(Question withdrawn.)

By Mr. Hood:

Q. 28. What does that piece of pipe look like? (Exhibit No. 62.)

A. My opinion is that that would be the top or funnel section of a piece of Tremie chute. I judge that by the hooks that are on it, and my opinion is that there were two more such hooks on that front section, which has been rusted through.

Q. 29. What condition on this exhibit do you find which would indicate that these hooks that exist on the apparatus had lower hooked ends, which had been broken off?

A. There would have to be something to support the next section of that chute.

Q. 30. Is there anything that you can find about this Exhibit No. 62 which would indicate that it had formed a part of an inclined chute supported by a boom in the manner illustrated in the sketch, No. 61?

A. No, nothing.

Q. 31. Is there anything about this Exhibit No. 62 which would indicate to you that that had not been used as such a chute?

A. There is.

Q. 32. What is that?

[fol. 46] A. Hooks on the side, which would be very unusual in the case of an inclined chute.

Q. 33. In Mr. Brown's testimony I find that he stated in cross-examination that in 1906 or 1907 buildings were built by Healy, Tibbitts & Company, one being called the Guntz Building and the other the Tillman and Bendel Building. Do you know anything about either of those buildings?

A. I do.

Q. 34. Were they built after you arrived in San Francisco?

A. They were.

Q. 35. Did you have any duties connected with the building of those buildings?

A. I placed the re-enforcing steel on the Tillman and Bendel Building.

Q. 36. What sort of apparatus was used to distribute the concrete on that building?

A. A concrete mixer, a wooden tower, hoisting engine, bucket, floor hopper, concrete carts on runways supported by horses on the floor; the old-fashioned method.

Q. 37. Were those runways placed after you had placed your reenforcing steel?

A. They were.

Q. 38. Do you have a distinct recollection of them?

A. Yes, I have.

Q. 39. Was there any boom supported chute used to chute the concrete on that job?

A. No.

Q. 40. What have you to say about the Guntz Building?

A. The Guntz Building is a steel frame structure with fireproof [fol. 47] floors where it would have been absolutely an impossibility to use a boom supported plant of any type.

Q. 41. How was the fireproof placed on that building?

A. It is hoisted up to various floors, and distributed by means of wheelbarrows and concrete carts. It is today.

Q. 42. You know that of your own personal knowledge on the Guntz Building, do you?

A. I do.

Cross-examination by Mr. Jones:

X Q. 43. Will you state again when you went to Healy, Tibbitts & Company?

A. I will say some time in the latter part of 1906 or 1907.

X Q. 44. Do you recall when the earthquake and fire occurred?

A. I do. I was not there then.

X Q. 45. Are you at the present time interested in the Concrete Appliances Company or in the Insley Company in any manner, directly or indirectly?

A. I am.

X Q. 46. What is your connection?

A. I am with the R. E. Brooks Company, of New York City.

X Q. 47. What is their relation to these other two companies?

A. We sell Insley equipment in New York City.

X Q. 48. Did Healy, Tibbitts & Company use any booms at all in connection with their construction work while you were with them?

A. Booms?

X Q. 49. Yes.

A. They did. You mean—I beg your pardon?

[fol. 48] X Q. 50. Did they use any booms in conection with apparatus for distributing concrete?

A. I do not recall it.

X Q. 51. With reference to this drawing, No. 61, it would not be a very difficult problem, would it, for a contractor to tie these various sections together so that they nested closely, and made a fairly stiff pipe for a short distance?

A. I do not know how you would support them.

X Q. 52. Have you ever seen grain spouts consisting of a series of tapering sections fitted into each other?

A. I cannot say I paid any attention to them.

X Q. 53. About how long have tremie been used for depositing concrete, to your knowledge?

A. I have not any idea.

X Q. 54. As early as 1906?

A. I would not be able to state.

X Q. 55. But they have been used for a long time, have they not?

A. Probably before my time. I have no knowledge.

X Q. 56. Do you happen to know whether tremie are supported from a boom on these floating structures on which they are usually used?

A. Vertically, yes. Horizontally, no.

X Q. 57. Any way.

A. Vertically, yes. Horizontaly, no.

X Q. 58. For the purpose of swinging them around to vary the point of deposit under the water?

A. I have seen them used recently, vertically.

X Q. 59. With reference to these several buildings you have referred to, including the Guntz Building, you did not visit these buildings every day, did you?

A. No, only when they were pouring the concrete.

X Q. 60. That would be at intervals of how long?

[fol. 49] A. Oh, it would be three or four days, maybe a week.

X Q. 61. I think you said you had something to do with arranging the re-enforcing bars?

A. I did.

X Q. 62. So that your work would be in advance of the concrete work?

A. Not altogether. Much of our steel was placed while the concrete was being poured on the same floor and in other portions of the building.

Redirect examination by Mr. Hood:

R. D. Q. 63. In your cross-examination, when you were asked when you went to San Francisco, your answer, as I understood it, was in the later part of 1906 or 1907?

A. No, no; 1906. I arrived there August 27, 1906, to be precise.

Recross-examination by Mr. Jones:

R. X Q. 64. How do you fix that date?

A. Well, I just remember the date I arrived there. I cannot tell you how I fixed it. I remember arriving at San Francisco on August 27, 1906.

FREDERICK E. ENGSTRUM, having been duly sworn, was examined and testified as follows:

By Mr. Hood:

Q. 1. Please state your name, age, residence and occupation.

A. Frederick E. Engstrum. Age, 47. Residence, Wilmington, [fol. 50] North Carolina. Occupation, president, Newport Shipbuilding Corporation.

Q. 2. How large a corporation is that?

A. Just completing seven million dollars of concrete ships.

Q. 3. What relation do you have with the complainants, the Concrete Appliances Company?

A. I was vice-president from the time of its incorporation until father died over a year ago. Then I have been president since.

Q. 4. Were you in Los Angeles at the time of the building of the Majestic Theatre?

A. Yes, sir.

Q. 5. And were you interested in the Concrete Appliances Company at that time?

A. The Concrete Appliances Company had not been incorporated at that time.

Q. 6. Were you interested in the company which was fabricating that building?

A. Yes, vice-president and secretary and treasurer.

Q. 7. And did you keep generally informed of its building operations and the apparatus that was used on them?

A. I was actively in charge of all the construction.

Q. 8. You are an engineer by education, are you?

A. By education and practical application.

Q. 9. When the fabrication of the Majestic Theatre Building had proceeded part way, what sort of apparatus was used in handling the concrete and depositing it at various points?

A. What we call the gravity system, tower and boom, and pipes, troughs.

Q. 10. Please describe that apparatus?

A. The apparatus is nearly similar to this model here with the exception that it was all built of wood, with iron connections, and [fol. 51] the boom was used in a slightly different manner, but the pipe was used suspended under the boom.

Q. 11. What was the purpose of the boom?

A. First it was to swing and obtain lateral delivery of the concrete of the spout end, and the first tower was built some fifteen feet from the building and on the south side of the center of the building.

Q. 12. What was used, if anything, to hoist the concrete?

A. A bucket and electric hoist.

Q. 13. Into what did the bucket discharge?

A. A hopper.

Q. 14. What was done with that hopper from time to time?

A. It was elevated from time to time.

Q. 15. What was done with the boom when the hopper was raised?

A. It was elevated accordingly.

Q. 16. And by what means, in what way was the chute supported, the first section of the chute?

A. The first section of the chute was supported at the intake below the hopper with a—I don't know what material—either a wire or a cable, and by cables or wire under the boom.

Q. 17. Did that apparatus operate satisfactorily?

A. It did.

Q. 18. Was it used in the complete fabrication of the building after its installation?

A. It was.

Q. 19. About how far up had the building progressed at the time that apparatus was installed?

A. Up to the time necessary to pour the first cantaliver balconies.

Q. 20. Do you recall approximately the calendar time, that is, the month and year, when the apparatus was installed?

[fol. 52] A. It was very early in 1908.

Q. 21. Who was the designer and originator of that apparatus?

A. Mr. Lee Callahan.

Q. 22. He was at work on the Majestic job, was he?

A. Yes, sir.

Q. 23. In connection with the placing of the concrete?

A. Yes.

Q. 24. What, if any, dealings did you or the Concrete Appliances Company have with the Healy-Tibbitts Company of San Francisco?

A. Our agents prepared designs for the Healy-Tibbitts Company of a barge to be used on the water front, consisting of a tower and boom and what we call our regular apparatus, in about 1912 or 1913.

Q. 25. That was subsequent to the building of the Majestic Building?

A. Yes.

Q. 26. You prepared designs of that kind for the company, did you?

A. Our agent engineers did.

Q. 27. In those designs what was the construction as to the manner of support of the first chute section?

A. The boom section on a tower.

Q. 28. What was to be the condition of the boom in its connection with the tower?

A. It was to be adjustable and swing.

Q. 29. By "adjustable" do you mean movable upwardly on the tower?

A. Yes, sir. Vertically.

Q. 30. What sort of a hopper was to be used?

A. The hopper was to be the regular type, similar in design to the hopper here, vertically adjustable.

Q. 31. After those designs were made did the Healy-Tibbitts [fol. 53] Company pay the Concrete Appliances Company royalties?

A. They paid the Parrott Company, which was our agent, and the Parrott Company paid us.

Q. 32. You say that was about 1912?

A. To the best of my recollection, it was about 1912.

Q. 33. Attention has been called to the fact in this record by the defendants of Concrete Appliances Company of Missouri bringing a certain suit against a man by the name of Gerhart for infringement, and that that suit stood for sometime without action, and was then dismissed for one of prosecution. What have you to say about the dismissal of that suit and the reason for its non-prosecution?

A. Our company's office was in Los Angeles, and upon investigation of the conditions at St. Louis we found that the school building which Gerhart was building was a public school building, and our company was a young company, and the expense of prosecution in St. Louis was considerable, and it being a public building we were not sure whether we could recover. It was at a distant point. So the matter was dropped at that time.

Q. 34. After you had filed your suit did you have any information which led you to believe that Gerhart was not again infringing, but had simply used the apparatus on that one school?

A. We never heard of any more infringement from that source.

Q. 35. And you were under the impression that there was no further infringement?

A. Yes.

Q. 36. I call your attention to Exhibit 61, which is a memory sketch said to illustrate a certain apparatus used by the Healy-Tibbitts Company in the fabrication of water front piers 42 and 44 [fol. 54] prior to the fire and earthquake in San Francisco in April, 1906. What have you to say as to the probability or feasibility of an inclined chute made up of tremie pipe sections, as illustrated in that sketch, being capable of use in such a position in the chuting of concrete?

A. I would say that it would be a very unstable conduit, and in my opinion it could not be poured through it.

Q. 37. Why not?

A. On account of the ups and downs and traps and the unstable condition of the conduit. I would like to also state that that is on an angle, different of course than vertical.

Q. 38. You mean that if such a tremie pipe were suspended practically vertical it is entirely practical as a conduit for concrete?

A. Yes.

Q. 39. But that when swung off at an angle, as shown in that sketch, and suspended only at its two ends, it would not be practical?

A. No.

Q. 40. You had knowledge of the negotiations between your agents, Parrott & Company, and Healy-Tibbitts Company, which led up to the grant of a license to the Healy-Tibbitts Company, did you?

A. Yes, sir.

Mr. Jones. Your Honor, in that connection, we have been very liberal with refraining from objecting to these leading questions, but as this is a prior use at a date that is important, I am going to ask Mr. Hood if he will try and be a little less leading.

The Court: Your questions have been rather leading, Mr. Hood. As a matter of fact, these questions of fact as to which the witness is testifying are in real controversy, and the impression you get [fol. 55] from answers to these questions do not help that side.

Mr. Hood: I might say that I recognized our time was pretty short, and I was merely trying to get the thing closed up.

The Court: I encourage direct questions as distinguished from leading questions. I think there is an important distinction between the two. I like counsel to be direct, and I do not stand on the formality of leading questions, but when you come to the real thing in controversy your record ought to show that the fact emanates from the witness and not from counsel, or you do not get the full benefit of the testimony.

Mr. Jones: I enter a formal objection to the foregoing questions as leading.

Mr. Hood: Do you mean by that, that you are now objecting to all of the questions which were asked?

Mr. Jones: Practically.

Mr. Hood: If that objection is made, of course, I have got to start in and do this all over again with the witness.

The Court: That would not help you any. If the idea is conveyed to the witness, you do not help the situation any by starting all over again. There is nothing objectionable in the last question.

Mr. Jones: I was not objecting so much to that specific question as to the whole series.

The Court: That kind of a question is all right. That is what I call a direct question. It is merely introductory, anyhow. When you come to the vitals of the testimony, let the facts emanate from the witness and not be found in the form of the question.

[fol. 56] By Mr. Hood:

Q. 41. Was any statement made to you by the Healy-Tibbitts Company alleging use of apparatus like that shown in Exhibit No. 61 at a time prior to the time of your negotiations?

A. No.

Q. 42. There has been some testimony in this case relative to the operations of the Hough Company, in Chicago. Did that company report to the Concrete Appliances Company as to the placing of licenses for the use of your apparatus?

A. Yes.

Q. 43. Did they in that way, under your contract with them, become responsible to you for an accounting?

A. Yes.

Q. 44. As a matter of fact, did they make such an accounting and payment?

A. No.

Q. 45. Why not?

A. We endeavored to get an accounting from them, but it was always postponed, and finally we cancelled our contract with them.

Cross-examination by Mr. Jones:

X Q. 46. Will you kindly glance at Defendants' Exhibit 44, labeled "Photographs of Majestic Theatre," and state whether you recognize any of the apparatus?

A. Yes.

X Q. 447. You mean you recognize these pictures as the Majestic Theatre Building under construction?

A. Yes, sir, and part of the apparatus.

X Q. 48. Will you kindly point out to the Court any boom shown in any of these four photographs?

[fol. 57] A. This was just started. The boom was on the outside of the building. This is the very first of the pouring down on the cantalivers of the balcony. This pipe here is the conduit.

X Q. 49. The conduit there is resting on false work or trestles, isn't it?

A. Yes. That is before it got up to the main point of the pouring.

X Q. 50. Does this first photograph represent the balcony tiers?

A. Yes.

X Q. 51. Was this boom you refer to sort of a prop that helped prop up the pipe?

A. No. It was a boom latticed with wood, similar to this boom. (Witness refers to the model before him.)

X Q. 52. That boom, then, would have been in such a location that it could have been readily seen from the street at some stage of the construction?

A. On the south side of the building.

X Q. 53. Is that the main street?

A. The south side of the building. The building faces east on Broadway.

X Q. 54. Do you recall whether the Wright-Collander Building was built before the Majestic Theatre Building?

A. No. After.

X Q. 55. Were the operations overlapping to any extent?

A. The Wright & Collander Building?

X Q. 56. Yes. There were two buildings.

A. Which Wright & Collander building do you mean?

X Q. 57. Is there more than one in Los Angeles?

A. There is a big office building on the corner of Fourth and Hill.

[fol. 58] X Q. 58. Some reference has been made by a prior witness to a Wright-Collander Building built about the same time as the Majestic Theatre Building. Do you know which building that would be?

A. The building commonly called the Wright & Collander Building is at Fourth and Hill.

X Q. 59. Do you think that was built later than the Majestic Theatre?

A. Yes.

(At 12.30 o'clock p. m. a recess was taken until 1.30 o'clock p. m.)

1.30 p. m.

Present: Parties as before noted.

FREDERICK E. ENGSTRUM, heretofore sworn, recalled.

Cross-examination (resumed) by Mr. Jones:

X Q. 60. Mr. Theodore Emtman owned ten per cent of the stock of the Concrete Appliances Company, did he not?

A. For a time, yes. I do not remember just what percentage.

X Q. 61. Did not he own ten per cent last December, or January, as late as that period?

A. Not as I know of.

X Q. 62. Was Lee Callahan a stockholder in that company?

A. I don't remember.

X Q. 63. What was the nature of Lee Callan's job on the Majestic Theatre Building, if you recall?

A. He was one of my foremen.

X Q. 64. What was Mr. Theodore Emtman's position on the work?

[fol. 59] A. He was foreman or general foreman for different jobs.

X Q. 65. That is, he had charge not only of this, but other jobs; whereas Callahan was simply on this job until he went to San Diego?

A. Yes.

X Q. 66. Some of the witnesses have said that Callahan was a straw boss. Would that *be* a correct description?

A. Well, he was a sub-foreman, a minor foreman, or foreman of a particular kind of work.

X Q. 67. Is Mr. H. W. Bryson a son-in-law of your father?

A. Yes, he is my brother-in-law.

X Q. 68. He is your brother-in-law?

A. Yes.

X Q. 69. Mr. Hugh W. Bryson and Mr. Theodore Emtman are interested together, are they not, in a concession of considerable magnitude relating to fishing rights and other rights, near some islands adjoining Lower California?

A. I don't know.

X Q. 70. Was Mr. Theodore Emtman ever an officer of the Concrete Appliances Company?

A. No.

X Q. 71. Were you an officer of the Concrete Appliances Company?

A. Yes, I have always been.

X Q. 72. And your father was?

A. Yes.

X Q. 73. What is your present office in that company?
A. I am president.
X Q. 74. Mr. Emtman and Mr. Bryson have been associated in various business enterprises, have they not, outside of the Concrete Appliances Company?
A. I understand they have.
[fol. 60] X Q. 75. Do you recall that Mr. L. A. Parker was an engineer-architect employed in connection with the Majestic Theater Building?
A. Yes, sir.
X Q. 76. And did you know of the following in connection with that work: Kurt O. Wetzel and Swan Johnson?
A. Yes.
X Q. 77. Referring to Exhibit No. 61, Healy, Tibbitts & Company's drawing that Mr. Hood showed you, in which the pipes were made up of a number of sections, is it not a fact that if the angle of inclination were made fairly steep that the concrete would flow through those sections, without necessarily making them vertical?
A. It depends on how steep they were.

W. H. Insley, heretofore sworn, recalled.

By Mr. Hood:

Q. 1. Mr. Ingsley, who manufactured the apparatus which is complained of in this present bill of complaint?
A. The Archer Iron Works.
Q. 2. Where are they located?
A. In Chicago.
Q. 3. They do not appear as a party to this cause, do they?
A. Not to my knowledge.
Q. 4. What, if any, negotiations were carried on between you and the Archer Iron Works subsequent to the filing of the bill of complaint in this case?

Mr. Jones: We object to this line of testimony as immaterial and improper.

(Testimony taken subject to the objection.)

A. Immediately at the time when I obtained the exclusive license [fol. 61] under this patent, the president of the Archer Iron Works visited me at Indianapolis, and endeavored to get a license under this exclusive license so that he or that concern could manufacture this equipment, and at frequent intervals prior to the bringing of this suit I have had some conversation with him on that subject.

By Mr. Hood:

Q. 5. What was your answer to the request for a license?
A. My answer was that I did not consider it expedient to grant him a license.

Q. 6. Did you have a conference with the president of the Archer Iron Works subsequent to the filing of the bill of complaint in this case?

A. I had.

Q. 7. What, if anything, was said by him relative to any defenses to be made in this present suit and if so, by whom was that defense to be made?

A. I got the impression that the Archer Iron Works was defending this suit. Their president appeared at Indianapolis with their attorney with relation to this matter.

Q. 8. Do you recall anything that was said upon which you base your impression that the Archer Iron Works was defending this suit?

A. I do not recall the conversation excepting that he sat in at the time of our consideration of the matter relating to it.

Q. 9. Was there anybody there at that conference from the organization of the Gomery Company?

A. There was no one there.

Q. 10. Or the Concrete Construction Company?

A. There was no one there representing the defendants except the president of the Archer Iron Works and Mr. Jones.

Mr. Jones: I renew my objection to this entire line of examina-
[fol. 62] tion, also the motion to strike out.

The Court: I will adhere to the practice I said I would follow. As far as I am at present advised, I think both objections are well founded.

By Mr. Hood:

Q. 11. Have you had any search made of the files of engineering publications to locate, if possible, any description of the building of piers 42 and 44 on the San Francisco water front?

A. I had a search made by the Director of the Engineering Libraries of the National Engineering Societies for any publication or notice in any engineering literature of the construction work.

Q. 12. And what was the report of that librarian?

A. The only thing that could be found was a report of the Harbor Commissioners with reference to the expense, with reference to payments made relating to that work.

Q. 13. Please state whether or not the librarian to whom you have referred made any report to you of finding any publication which gave any description of any special apparatus used in the fabrication of piers 42 and 44 on the San Francisco water front?

(Objected to as secondary evidence and as hearsay.)

A. Nothing that could be found.

By Mr. Hood:

Q. 14. I show you Defendants' Exhibit No. 61, which is a sketch made recently, and alleged to be an illustration of the apparatus

which was used in the fabrication of the piers 42 and 44 on the San Francisco water front by Healy, Tibbitts & Company, and I call your especial attention to the upwardly and downwardly inclined series of pipe sections, and ask you to state whether or not from your [fol. 63] experience as a builder of concrete handling machinery such an apparatus could be used in the condition shown in that sketch to successfully handle concrete?

A. It could not. It would not carry the concrete.

Q. 15. Why not?

A. Because the sketch shows a chute designed and built for vertical use held in an inclined position, and it would sag, and the concrete would not flow through it in that position.

Q. 16. Will you please examine Defendants' Exhibit No. 62 and state what it is and what its characteristics are?

A. It is similar in all points of construction, in its cone shape and in the hooks at the top, to vertical tremie sections, of which I have manufactured and sold a good many hundreds.

Q. 17. Is the construction of the exhibit of such a character that the series so connected in the manner shown in Defendants' Exhibit No. 61 could be successfully used as an inclined chute?

A. They could not be sucessfully used excepting at a very slight inclination from the vertical.

Cross-examination by Mr. Jones:

X Q. 18. With reference to the licensees to which I believe you have referred, were the Lakewood and Ransome Companies quite substantial companies at the time you gave them licenses?

A. They were considered so.

X Q. 19. They were then engaged in substantially the same line of business that you were, that is, the manufacture of contractors' equipment?

A. They were.

X Q. 20. And those two controlled quite a large proposition of the business of the country, did they not?

[fol. 64] A. They were large manufacturers in the field.

X Q. 21. At this alleged conference in Indianapolis, at which I believe you state I was present.

A. Yes, sir.

X Q. 22. Didn't you or Mr. Hood make a statement to the effect that you did consider apparatus to be an infringement which consisted of chutes hung from an inclined cable, the so-called line suspension type, and that the only thing you did not charge as an infringement were the chutes supported on horses?

A. I did not have such a conversation, Mr. Jones, unless it was debated among ourselves at the time as to what was a boom or the eqivalent of a boom. There was a stage when we might not have been able to have answered that question exactly.

Mr. Hood: I offer in evidence the depositions of Edward Anderson, Hooper Anderson, William T. Parker, Lee Callahan, Charles

Cooper, Rowland Brinckley, Carter Gay, Fred M. Gliner, J. S. Goldback, Andrew J. Kerns, and William N. Thornton

Also stipulations as to testimony which would have been given by P. J. Curran, William B. Ittner and R. M. Milligan.

Also the exhibits which have been previously referred to in the depositions just mentioned, which have been identified and marked as follows:

"Plaintiffs' Exhibit A, Callahan Memory Sketch."
"Exhibit B, Callahan Drawing."
"Exhibit C, Photograph of Timkin Apparatus."
"Exhibit D, Callahan, November 20, 1908, Drawing."
"Exhibit E, Kerns Sketch."

[fol. 65] We have an agreement that photostats or prints of originals are to be used instead of the originals.

Mr. Jones: The objections of record are repeated.

(Plaintiffs close.)
(Testimony closed.)

DEPOSITIONS OF H. M. KEBBY AND ROBERT TIBBITTS TAKEN ON BEHALF OF THE PLAINTIFFS—Filed February 8, 1922

STATE OF CALIFORNIA,
City and County of San Francisco, ss:

H. M. Kebby, of the City of Alameda, County of Alameda, State of California, and Robert Tibbitts, of the City and County of San Francisco, State of California, residing more than 100 miles from the place where the trial of this action will occur, witnesses called on behalf of plaintiffs herein, being duly cautioned and sworn to testify the whole truth, and being carefully examined, depose and say as hereinafter set forth.

Arther M. Hood, for plainffs;
George P. Barton, for defendants.

HARRY M. KEBBY deposes and says as follows:

Direct examination by Mr. Hood:

Q. 1. Please state your name, age, residence and occupation?

A. Harry M. Kebby, 2127 Eagle Avenue, Alameda, California; civil and mechanical engineer; age 61.

[fol. 66] Q. 2. How long have you been a practising engineer?

A. Forty years.

Q. 3. You were intimately connected, as an engineer, with the development of the cable railways systems of San Francisco and at various other points in the United States, were you not?

A. Yes.

Q. 4. Were you employed in any capacity in connection with the construction of pier 38 on San Francisco water front, if so

please state what your position was, and briefly the character of your duties?

A. Yes, as chief inspecting engineer for the State Harbor Commission. Duties to superintend the construction of the work, and see that the contract was carried out as per specifications.

Q. 5. While you were engaged in that work did you take any photographs of the job as it progressed?

A. Yes.

Q. 6. I hand you a panoramic photograph consisting of three sections asking you to state what that is, when the original negative was taken, and by whom?

A. This photograph which was taken by myself represents the condition of the work on the date marked on the photograph.

Q. 7. And what is that date?

A. May 25th, 1909.

Q. 8. And of what pier is that a photograph?

A. Pier 38.

By Mr. Hood: Counsel for plaintiffs offers the photograph, just referred to by witness, as Plaintiffs' Exhibit O, Kebby, May 25, '09. Photo of Pier 38.

Q. 9. Will you please describe briefly the tower apparatus at the right of the group of four towers at the right-hand end of Exhibit O? [fol. 67] A. This represents a hoisting apparatus used for lifting concrete from the mixer to a hopper fastened to the upper part of the structure, from where it was dumped through a suspended pipe into the cylinders below.

Q. 10. I notice that you said in your last answer that the hopper was fastened to the upper part of the structure. Please describe briefly the construction of this hopper and the manner of its association with the tower, and state whether or not the construction was such that the hopper could in any way be vertically adjusted on the tower?

A. The hopper was fastened to the tower by means of timbers bolted to the tower structure and was connected through a runway in the interior of the tower so that the bucket when it was elevated containing the concrete would be dumped automatically when it arrived at the proper height. The hopper could not be shifted in any direction, as it was bolted fast to the tower.

Q. 11. How were the platform timbers which supported the hopper braced, or supported?

A. They were either spiked or bolted.

Q. 12. I hand you another photograph asking you to state what it is, and who took the photograph, and when?

A. This is a photograph taken by myself on April 8, 1910, showing a similar tower built on the same lines, and used for filling a bottom dump bucket for depositing concrete under water in a bulkhead sea wall.

Q. 13. Is the tower apparatus at the left-hand end of this photograph the same tower apparatus as is shown at the right-hand end of Exhibit O?

A. No, but it is shown at the left-hand end of pier 38 panorama.
[fol. 68] Q. 14. How did these two devices compare as to structure, in the manner in which the tower hopper was supported, the manner in which the discharge pipe was connected to the hopper, and other general details?

A. For all practical purposes they were of the same type of construction.

(Counsel for plaintiffs offers the photograph referred to in Q. 13 as Plaintiffs' Exhibit P, Kebby, April 8, 1910, photo.)

Q. 15. I notice in Exhibit P immediately under the hopper platform a sort of supplemental tower structure, which I mark with a reference letter A. Will you please state what that is?

A. Just a support for the hopper. The same construction is shown in the pier 38 machine first described, at the extreme right of Exhibit O.

Q. 16. I have marked with the letter B a portion on Exhibit P. What is that part?

A. The hopper, made of steel.

Q. 17. And what are the parts C and D?

A. Part C is an enlarged funnel-shaped end constructed on pipe D. This funnel-shaped end C has hooks riveted on, to which are fastended chains running to hopper B, to support the pipe and hold it suspended from hopper B.

Q. 18. Please state whether or not parts, like parts A, B, C and D, were in the tower structure at the extreme right-hand end of Exhibit O?

A. Yes. They were of the same design.

Q. 19. What carried the tower structures, mixer, hoist hopper and pipe which you have been describing?

A. A barge floated in the water.

Q. 20. As I understand it, the part A was connected to and formed a part of the hopper support, is that right?

[fol. 69] A. It was the only support for the hopper.

Q. 21. How many chains were there connecting part C with the hopper B?

A. Four.

Q. 22. How were they spaced?

A. At 90 degrees apart.

Q. 23. Please state whether or not there was any gate structure by means of which flow from the hopper to the pipe C-D could be controlled?

A. No, there was not, as the concrete was never held in the hopper.

Q. 24. What was the character of concrete mix which was used in the fabrication of pier 38?

A. The concrete used in pier 38 was a practically dry mix, and the inspectors had orders to hold them up if they allowed the concrete to become too wet.

Q. 25. With the chain connection between the parts B and C about how much movement or swing of the pipe D could be had?

A. It could only be swung a short distance, and had to be held in the new position or it would swing back to its orignal position.

Q. 26. When the pipe D was swung to one side or another, what happened to the chain connections between parts B and C? Did they all remain tight or did some of them have slack in them?

A. The chain connections between B and C were constructed of special Norway iron, in order to make them strong enough so that when the pipe was swung from the vertical position two of the chains would carry the load, as either one or two were bound to become slack when the pipe was moved.

Q. 27. In the operation of this device, in the fabrication of pier 38, at what angle to the vertical was the pipe D used?

A. The pipe in practically all cases hung vertical.

[fol. 70] Q. 28. Please describe briefly the operation of preparing for and delivering concrete from the hopper B to a point of deposit in the pier structure?

A. In the construction of these concrete cylinders the first operation was placing a steel cylindrical caisson, which was then driven to a sufficient depth to stop the penetration of water or silt, which might be forced in from outside pressure. This cylinder was then cleaned of water and mud by means of an orange peel bucket, which was operated from either the same or another floating pile-driving machine. When the water and mud had been excavated down to hard bottom men were lowered with picks and shovels to complete the excavation until a satisfactory hard bottom had been reached. This machine then moved out of the way and another floating pile-driving machine picked up from the water a circular wooden concrete form, inside of which was fastened the steel reinforcing. This was placed in position on the lines run by the engineers, and braced in this position, and the machine then moved away and the floating concrete barge moved into position against the cylinder and deposited the concrete. The concrete was dumped from the hopper already described through the pipes into another steel hopper held at the top of the form, and from this hopper a number of short sections of pipe were suspended. At the bottom of the cyliner a man was kept all the time so as to distribute and tamp the concrete as it fell through this pipe. As the concrete in the cylinder raised this man had to remove short sections of the pipe so that the pipe would not be buried in the concrete. The man being suported by the concrete below necessitated the concrete being kept in a practically dry condition; otherwise the man would sink too deep in the concrete.

Q. 29. When one of the cylinders was completed what was done [fol. 71] with the barge, preparatory to the placing of concrete in another cylinder?

A. About the time that the concrete barge was through filling one cylinder the before-mentioned machines would have another cylinder ready for concrete and the barge would be moved up to the same position relative to the new cylinder.

Q. 30. And what was the approximate condition of the pipe D relative to the vertical angle during the delivery of concrete from hopper B to the cylinder?

A. The pipe D hung vertical.

Q. 31. Please state whether or not the construction was of such character that the pipe D could be practically held or caused to remain at a fairly flat angle, say less than 45 degrees from the horizontal?

A. No, it could not.

Q. 32. Please state what is the part which I have indicated by the letter E in Exhibit P?

A. This was a wooden strut placed behind pipe D so that it would reach far enough to fill the bottom dump bucket, shown in the center of the picture.

Q. 33. Please state whether or not the part E in Exhibit P had a double pivot jointed connection with the tower structure?

A. No, it had not.

Q. 34. Then as I understand it this part E was just a temporary stick crowded in between the pipe D and the tower, is that right?

A. That is correct.

Q. 35. I hand you another photograph on which I have marked the various parts C, D and E, and ask you to state whether or not those parts correspond with the parts similarly designated in Exhibit P.

A. They are photographic representation of the same machine shown in Exhibit P.

Q. 36. Please state who took this photograph, and when?

[fol. 72] A. I took this photograph myself on February 24, 1910.

By Mr. Hood: Counsel for plaintiffs offers in evidence the last-mentioned photograph as Plaintiffs' Exhibit Q, Kebby, February 24, 1910, photograph.

Q. 37. Please state whether or not you have had these Exhibits O, P and Q, continuously in your possession since the dates which appear on said photographs?

A. I have since they were printed.

Q. 38. What sort of a deck did pier 38 have?

A. Reinforced concrete, carried on steel beams, covered with concrete.

Q. 39. How was the concrete for the deck of pier 38 placed?

A. By mixing on the barge shown on the left of Exhibit O, hoisted through the tower, dumped through the hopper and pipe into a stationary or semi-stationary hopper on the deck below. From this hopper it was dropped into wheeled concrete buggies and wheeled to place, and then leveled and tamped.

Q. 40. Is there anything in Exhibit O which shows the manner of distributing the concrete for the deck? If so, please state what it is?

A. Exhibit O shows one man wheeling a buggy of concrete on the runway over to the far side of the pier from the mixer, and there shows a man with a shovel waiting to distribute the concrete.

Q. 41. Please indicate the man wheeling the concrete, by the letter F, and the man placing the concrete by the letter G.

A. I have done so.

Q. 42. Can you state the approximate time when the placing of concrete in the cylinders for pier 38 was begun?

[fol. 73] A. During the months of January or February, 1909.

Q. 43. Did you ever do any work on piers 42 and 44, on the San Francisco water front?

A. No.

Q. 44. I understand that at some time subsequent to the completion of those piers they were reconstructed, and the original concrete cylinders taken away. Did you have anything to do with that work?

A. In your previous question I thought you were referring to the original construction, of piers 42 and 44. I had charge for the State Harbor Commission of the reconstruction of piers 42 and 44. The original concrete cylinders of piers 42 and 44 were gradually falling down, as the teredos got at the piles supporting the cylinders and destroyed them. The engineering department of the State Harbor Commission arrived at the conclusion that it would be policy to remove all of these cylinders before serious damage was done, and replace them with creosoted wooden piles. The original steel beams and the wooden deck were left in place, except as to necessary repairs which had to be made. This was approximately during 1916 and 1917.

Q. 45. What was the character of the concrete in the cylinders which were removed at the time of removal?

A. Some of it was intact. The majority of it fell to pieces when the original forms were cut off.

Q. 46. Please state whether or not from your experience as an engineer, the condition of those cylinders, at the time of their removal, would indicate the character of original mix, as to whether it was wet or dry?

A. I could not say.

[fol. 74] Q. 47. In the apparatus used on pier 38, was there any connection, I mean mechanical connection, between the strut E and the tower structure?

A. No.

Q. 48. I notice in Exhibit Q a man standing just to the left of the lower end of pipe D. Can you tell from the photograph what this man was doing? If so, please state what?

A. This man, by means of a line, attached to the pipe, pulled it to one side, so that the bottom dump bucket could be picked up by the derrick, after being filled.

Q. 49. Please state whether or not the construction of hopper B and pipes C and D, and strut E, in the apparatus used in the fabrication of pier 38, was of such character that the lower end of the pipe D being deflected to one side or another from its medial position, it would remain in the deflected position without the application of some external force or means, such, for instance, as the man you have just mentioned?

By Mr. Barton: Question objected to as leading.

A. No, it would not.

Cross-examination by Mr. Barton:

X Q. 50. Did you ever work for Mr. Charles T. Yerkes, formerly of Philadelphia and of Chicago?

A. I did, through the engineering firm of Wright and Meysenburg.

(Cross-examination closed.)
(Deposition closed.)

Harry M. Kebby.

[fol. 75] HARRY M. KEBBY, being recalled, testifies as follows:

Direct examination by Mr. Hood:

Q. 1. My Kebby, in your previous examination which has just been closed, I forgot to show you Defendants' Exhibit 61, which has been offered in evidence by defendants as illustrating an apparatus alleged to have been used in the fabrication of piers 42 and 44, and then, at a later time, used in the fabrication of pier 38. I hand you this exhibit and ask you to state whether or not you understand the mechanism illustrated by the drawing?

By Mr. Barton: The question is objected to as leading, and it is believed the statement of the question is not accurate.

A. I believe so.

Q. 2. Please state whether or not an apparatus of the character shown in this exhibit, comprising a boom connected to the tower by a mechanical pivotal connection, carried in such manner that it could be vertically adjusted on the tower, and supporting by block and tackle the lower end of a pipe composed of several sections, and flexibly connected at its upper end to a hopper on the tower structure, was ever used in and during the fabrication of pier 38 for the distribution of concrete?

By Mr. Barton: The recital of the question is objected to as leading.

A. It was not.

Q. 3. Please state whether or not any barge-tower concrete mixing apparatus other than those shown in Exhibit O, was used in and during the fabrication of pier 38?

A. No, there was not.

[fol. 76] Cross-examination by Mr. Barton:

X Q. 4. Are you familiar with grain carriers?

By Mr. Hood: Question objected to as not proper cross-examination.

A. To some extent.

X Q. 5. Did you ever see a grain carrier analogous in construc-

tion and mode of operation to any part of the apparatus shown in Fig. 1 of Exhibit 61?

By Mr. Hood: Question objected to as not proper cross-examination.

A. No.

X Q. 6. Did you ever see a grain carrier having a pipe for conveying the grain?

By Mr. Hood: Question objected to as not proper cross-examination.

A. Yes, but not under these conditions.

X Q. 7. Was that pipe hung so that it could be rotated both vertically and horizontally, as illustrated in this sketch?

By Mr. Hood: Question objected to as not proper cross-examination.

A. All of the grain carrying pipes which I have seen worked on an entirely different principle.

X Q. 8. Describe just how this apparatus of Fig. 1 as illustrated is intended to work?

A. The apparatus shown in Fig. 1 is absolutely impractical and will not work at all.

X Q. 9. You understand it, however?

A. I believe I understand what this plan is intended to convey.

X Q. 10. Well, go on and tell what you believe it is intended to convey?

A. At this point I wish to state that I believe this examination is going into the realms of an expert, and as I have not been employed as an expert in this case I decline to state.

[fol. 77] By Mr. Hood: The witness is advised that this particular question hardly calls for expert testimony. The witness will recall that in the direct examination he was asked if he understood the construction illustrated by Exhibit 61, and then asked if such an apparatus was used in connection with pier 38. Opposing counsel is trying to test you as to whether or not you do understand the illustration, and if you refuse to answer then of course your statement of fact as to the non-use of such an apparatus in connection with pier 38 will not be admissible. Counsel for plaintiffs will appreciate it, therefore, if you will be good enough to show whether or not you understand the construction by giving a description such as has been asked for. In case you are asked questions which really call for an expert opinion I will see to it that you are properly instructed and protected in your rights.

By Mr. Barton: It is submitted that counsel for plaintiffs should not thus in the midst of a cross-examination gratuitously instruct his witness.

A. What I think it is intended to convey—the blue print Fig. 1 shows a boom connected to the tower for supporting the end of

the pipe leading from the hopper. It states that the pipe consists of flexible joints held together by chains. It would be impossible to hold a flexible joint pipe, held together by chains, in the position shown on the drawing, as the flexible joints would sag between the supports from the boom and the hopper into the form of a catenary curve and would not remain straight as shown. Furthermore, there is nothing to show a universal joint connection to the hopper, which they must necessarily have in order to swing this pipe vertically and horizontally.

[fol. 78] By Mr. Barton: The answer is objected to as not responsive to the question.

By Mr. Hood: That portion of the answer beginning with "It would be impossible" and continuing to the end of the answer is objected to as an expression of opinion, the witness not having been produced as an expert. The attention of the witness is called to the fact that the preceding question asked for a description by the witness of the structure intended to be illustrated by Fig. 1. I will appreciate if the witness will, therefore, in response to the question, refer to the various parts of this figure in a brief description, so that the Court will be enabled to determine whether the witness does, in fact, understand the drawing and the mechanism it is supposed to illustrate.

By Mr. Barton: I wish my question to stand as it is without any amendments on the part of counsel for plaintiffs.

(Question read to the witness.)

By Mr. Hood: Question X Q. 8 is objected to, as calling for an opinion as to what somebody else intended. The question should have been for the witness to state his interpretation of the drawing.

By Mr. Barton: I am not prepared to thank counsel for his attempt to amend my question. I ask that the question be read again.

A. As I understand it the apparatus shown in a crude form in Fig. 1, is intended to be used to distribute concrete, mixed below on the deck, dumped into a hoisting bucket, raised and dumped into a hopper at the top of the tower, and then shot through the pipe marked as "flexible joints held together by chains."

X Q. 11. How do you understand is the concrete conveyed into the top of the pipe?

A. I believe I gave that in my previous answer.

[fol. 79] X Q. 12. Please give it again?

A. It is to be raised in a hoisting bucket from the mixer, dumped into a hopper at the top of the tower, and then from the hopper dropped into the pipe.

X Q. 13. How is it dropped from the hopper into the pipe? What special mechanism do you think was intended to be used?

By Mr. Hood: Question objected to as not proper cross-examination, unless it be interpreted as an inquiry as to what the drawing shows, to indicate the intention as to operation.

By Mr. Barton: I object to the virtual instruction of the witness as to an answer he should give when under cross-examination.

A. No mechanism whatever. The concrete would naturally drop into the pipe by gravity. The drawing shows a lever and a memoranda says: "Valve operated from platform with lever." This valve would not assist the concrete to drop into the pipe, but would retard it.

X Q. 14. Is such a valve a common device to be used to control keeping the concrete from a hopper?

A. Yes, but in an entirely different manner from anything which can be guessed at from the arrangement shown.

X Q. 15. With that drawing before you, in view of your experience in such matters, would you be able to either construct or direct the construction of a valve to control the keeping of the concrete from the hopper?

A. Yes, if the concrete was wet enough so that it would flow after being retarded by a valve.

X Q. 16. You could go right on the market, or you could go to any good mechanic and tell what was needed could you not? And have the work of putting in a valve or gate promptly done, could you not?

[fol. 80] A. Yes, but I would not be willing to say that it would work under the conditions shown.

X Q. 17. But your valve would be all right, wouldn't it?

A. The valve would be all right as a retarding apparatus.

X Q. 18. Such valves are, speaking figuratively, as old as the hills, are they not?

A. The gate valve is the oldest known valve there is.

X Q. 19. What would you give as the technical name of the arm extending to the right and upwardly from the tower?

A. I would call it, as it is marked, a boom.

X Q. 20. And do you understand that it was the intention of that drawing, or the one who made it, to show a boom by that illustration, for moving the concrete pipe about horizontally and vertically, as it were, on a universal joint?

A. The boom can have nothing to do with moving the pipe horizontally—only as a means of holding the end of the pipe vertically.

X Q. 21. I was asking you, in view of the legends on the drawing, as to what you consider was the intention of the one who designed the drawing to illustrate with respect to the relations between the boom and the concrete pipe or chute?

A. There is nothing that I can see on this drawing showing that the pipe is to be moved horizontally. A legend on the tower says "Hinge movable up and down, also sideways."

X Q. 22. Has your profession included the evidence as an expert witness?

A. I have been called as an expert on cable railway cases.

[fol. 81] X Q. 23. How do you distinguish between the duties

of a witness when testifying in the ordinary way, or as an "expert" so-called?

A. I could not say, except as to individual cases.

(Deposition closed.)

Harry M. Kebby.

ROBERT TIBBITTS, produced as a witness, as noted above, deposes as follows:

Q. 1. Please state your name, age, residence and occupation?

A. Robert Tibbitts, age 60 years, 16 California Street, San Francisco, contracting and constructing business.

Q. 2. In what business were you engaged in the year 1906?

A. In the construction business, doing a lot of wharf construction for the State on the bay here, at that time.

Q. 3. Of what company were you a member at that time?

A. The Healy-Tibbitts Construction Company.

Q. 4. Did you have anything to do with the orginal construction of piers 42 and 44 on the San Francisco water front, and if so please state briefly what your duties were in the fabrication of those piers?

A. I generally supervised the construction entirely.

Q. 5. By that do you mean that you were directly on that job from day to day in active superintendence of construction work?

A. Yes, in the most part of the work; sometimes I was away.

[fol. 82] Q. 6. Please state how the concrete in that job was distributed from the mixer to the various points, and where the mixer was located?

A. We had a mixing plant located between 42 and 44, what we call the bulkhead. The materials were hauled there and the concrete was mixed and sent out in cars or buggies to the wharf.

Q. 7. Was this bulkhead on the shore edge?

A. Yes.

Q. 8. What kind of a deck did those two piers have when they were done?

A. They had a wooden deck, if I remember rightly.

Q. 9. It has been testified in this case on behalf of the defendants that some of the concrete used in the making of the cylinders for supporting the decks of piers 42 and 44, was distributed by means of a mixing and hoisting apparatus, carried on a barge, this barge having a tower in which there was a hoisting skip, a hopper near the top of the tower, a chute or pipe connected to the hopper, and supported at its outer end by means of block and tackle suspended from a boom which was mechanically pivotally connected to the tower at the lower end of the boom and extended outwardly and upwardly with the block and tackle suspended at the outer end of this boom and extended down so as to support the lower end of the pipe or chute. Please state whether or not such an apparatus was used by the Healy-Tibbitts Company in the distribution of concrete in fabricating piers 42 and 44?

A. We used no floating means at all on 42 or 44. Our concrete was all put in from the top and cars are wheeled out from the mixer that was located on the bulkhead between 42 and 44.

Q. 10. I show you a panoramic photograph which has been [fol. 83] marked in this case as Plaintiffs' Exhibit O, and ask you to state what that photograph illustrates?

A. Well, it's the construction of pier 38, which we practically did it all with floating appliances.

Q. 11. What had you to do with the construction of pier 38?

A. Well, I had charge of the entire works—directed it all in every way.

Q. 12. About when did you begin the placing of concrete in pier 38?

A. Well, from the date of construction on this (witness refers to Exhibit O) I could say it was very shortly prior to this date (May 25, 1909), not over thirty days prior.

Q. 13. At the right-hand end of Exhibit O at the extreme right of the four tower devices, there appears to be a concrete handling apparatus of some kind. Can you describe that apparatus briefly as to what it was?

A. This fourth derrick here is a tower that was rigged to elevate concrete up and get it over the top of the cylinders and put it in cylinders, discharged in a hopper on top and come down through a closed pipe connected together with chains and wire as we saw fit to hook them together.

Q. 14. Do you recall what sort of a connection there was between the pipe and the hopper?

A. Well, we had a large-mouthed hopper built, a female hopper that went over the end of the male hopper that discharged into the pipe.

Q. 15. Do you recall how that female hopper was connected to the male hopper?

A. Well, we just chained it up there so that it had plenty of slack.

Q. 16. Please state whether or not the Healy-Tibbitts Company prior to the beginning of work on pier 38 had ever used a concrete [fol. 84] hoisting and delivering apparatus comprising a tower on a barge, a hopper and a suspended delivery pipe such as is shown in Exhibit O?

A. Now, this derrick on the barge or the tower was the first one that was ever built by the Healy-Tibbitts Company and was built at the start of the contract on pier 38, which was not sixty days prior to this date here (witness points to the date May 25, 1909, on Exhibit O).

Q. 17. Did the Healy-Tibbitts Company have anything to do with the building of pier 40 on the San Francisco water front?

A. No, had nothing to do with pier 40.

Q. 18. Did the Healy-Tibbitts Company build pier 36 on San Francisco water front?

A. No.

Cross-examination by Mr. Barton:

X Q. 19. You are acquainted with Martin T. Brown, are you not?

A. Yes.

X Q. 20. Also Mr. Charles C. Horton?

A. Yes.

X Q. 21. And Mr. Fred Ayer?

A. I know him, he has worked for me, but he has never been a superintendent for me—just a common workman.

X Q. 22. Do you remember of seeing either Brown or Horton or Ayer in connection with the work on piers 42 and 44?

A. Those are only boys that were carrying tools and keeping time for me. They had nothing to do with the work—no more than an office boy here.

X Q. 23. But did you see them or either of them in connection with the work on piers 42 and 44?

[fol. 85] A. Well, I don't know how to answer a question. They were both in my employ and I must have seen them, but I never discussed what I was doing, because they were merely children to me.

X Q. 24. But you did see them while that work was going on and know who they are, didn't you?

A. I haven't any answer for it at all. I don't know as I ever saw Mr. Horton on the work, because it was not his duty to be on there.

X Q. 25. Are you now an officer of the Healy-Tibbitts Company?

A. No, sir.

X Q. 26. When did you sever your connection with the Healy-Tibbitts Construction Company?

A. It was in December, 1910.

X Q. 27. And did you then retire from business, or are you still in business?

A. I am in business now under the firm name of Tibbitts Pacific Company.

X Q. 28. Did the Healy-Tibbitts Construction Company get the name "Tibbitts" from you?

A. Yes.

X Q. 29. Last May I was here and Mr. Brown and Mr. Horton showed me an old barge sunk in the mud in a slip that I think has been a store place for the Healy-Tibbitts Construction Company. Do you know what barge it is that I refer to?

A. Yes, probably this barge here (witness points to the barge carrying the tower at the right-hand end of Exhibit O) was sunk out beyond the sugar refinery.

X Q. 30. That had a tower and was used for placing concrete, was it?

A. Yes, in the cylinders; and at times was used on the top of the wharf by wheeling the concrete in buggies for the floor of the wharf.

[fol. 86] X Q. 31. When did you last see that old barge, or any part of it?

A. Well, not three hours ago.

X Q. 32. What is its condition now?

A. It is completely submerged, except a small part of the top of the tower. I was down to San Mateo this morning, and in driving back I showed my boy this submerged structure with the tower sticking out.

X Q. 33. Was it high tide?

A. No, very near low water, about a third of the tide in.

X Q. 34. When did you see it last prior to this morning?

A. Well, I see that very often. I have a home and drive that way and can't help seeing it close to the road.

X Q. 35. Are you in the business now of placing concrete, building concrete structures?

A. Yes, concrete wharves and structures of that kind.

X Q. 36. What relations, if any, have you with the Insley Company?

A. I don't know the Insley Company, don't know of them at all.

X Q. 37. Did you ever hear of anyone by the name of Insley that had to do with apparatus for placing concrete by gravity?

A. Don't recall any names at all, don't know anybody by that name.

X Q. 38. Did you ever know Hugh W. Bryson, of Los Angeles?

A. No.

X Q. 39. Did you ever hear of the Concrete Appliances Company? [fol. 87] A. No, I don't recall it.

X Q. 40. Did you ever hear of Theodore Emtman?

A. No, I don't recall it.

X Q. 41. Did you ever hear of Lee Callahan, of Los Angeles?

A. No.

X Q. 42. Did you ever hear of Hiram Johnson?

A. Is this pertaining to—I know Hiram Johnson.

(Cross-examination closed.)

(Deposition closed.)

Robert Tibbitts.

It is stipulated by and between counsel for the respective parties that counsel for plaintiffs may retain Exhibits O, P, and Q in order that copies of the same may be prepared for counsel for defendants.

(Plaintiffs rest.)

STATE OF CALIFORNIA,
City and County of San Francisco, ss:

I hereby certify that on the third day of February, 1922, before me, Eugene P. Jones, a notary public in and for the above State, city and county, acting as special examiner, by agreement of counsel, at Room 419 Crocker Building, City of San Francisco, personally appeared, by agreement of counsel for the respective parties, between the hours of 10 A. M. and 3 P. M., the witnesses, Harry M. Kebby and Robert Tibbitts, and Arthur M. Hood, Esq., appearing

for plaintiffs, and George P. Barton, Esq., appearing for defendants, and the said Harry M. Kebby and Robert Tibbitts, being by me first duly cautioned and sworn to testify the whole truth, and being carefully examined, deposed and said as in the foregoing annexed depositions set out.

[fol. 88] I further certify that the said deposition of Harry M. Kebby was begun at 10 A. M. on the third day of February, 1922, and completed at 12.30 P. M. on that day, and that the deposition of Robert Tibbitts was begun at 2 P. M., and concluded at 3 P. M.

I further certify that the several exhibits referred to in said deposition, to wit: Plaintiffs' Exhibits O, P and Q, were offered in evidence, and marked for identification as set out in said deposition, and, in accordance with the stipulation annexed hereto, delivered by me to counsel for plaintiffs.

I further certify that the said depositions were then and there reduced to typewriting under my personal supervision, and were, after they had been reduced to writing, subscribed by the respective witnesses, and the same have been retained by me for the purpose of sealing up and directing the same to the clerk of the court, as required by law.

I further certify that the reason why the said depsoitions were taken was that the said witnesses reside at Alameda, California, and San Francisco, California, respectively, more than 100 miles from Philadelphia, Pennsylvania, the place where this cause is to be tried.

I further certify that I am not of counsel nor attorney to either of the parties, nor am I interested in the event of the cause.

I further certify that the fee for taking said deposition, $36.50, has been paid to me by the plaintiffs, and the same is just and reasonable.

Witness my hand and official seal at the City and County of San Francisco, this third day of February, 1922.

Eugene P. Jones, Notary Public, Acting as Special Examiner.

(Seal.)

[fol. 89] DEPOSITIONS OF CHARLES C. HORTON AND FRED L. AYER ON BEHALF OF DEFENDANTS—Filed February 8, 1922

Testimony on the part of defendants taken, pursant to order of the court and by agreement of counsel, at No. 419 Crocker Building, San Francisco, California, before Eugene P. Jones, a notary public acting as special examiner, beginning at 10 a. m. Wednesday, February 1, 1922.

Present: George P. Barton, Esq., for defendants; Arthur M. Hood, Esq., for plaintiffs.

By Mr. Barton: I offer in evidence certified copy of certain minutes or proceedings of the Board of State Harbor Commissioners of San Francisco; for convenience, copied upon the record as follows:

Commissioners: John H. McCallum, President; H. H. Cosgriff, F. S. Moody, Hilda Gohrman, Sec'y.; Jas. Byrne, Jr., Asst. Sec'y.; Daniel A. Ryan, Attorney; Frank G. White, Chief Engr.

(Copy)

Board of State Harbor Commissioners, San Francisco, California, Office of the President

San Francisco, May 18th, 1906.

The Board of State Harbor Commissioners met this day pursuant to call of the President.

Present: Messrs. Spear & Mackenzie.

Absent: Mr. Crocker.

[fol. 90] The minutes of the meeting of May 16th, 1906, were not read.

Agreem't with Healy, Tibbitts & Co. of Bonus for Speedy Completion of 42 & 44

Pres. Spear presented an agreement dated April 29th, 1906 entered into with Healy, Tibbitts Co. whereby a bonus of $5,000.00 was to be paid to them in consideration of the completion, with certain exceptions, of Piers #42 and 44 within two weeks from date thereof.

It was ordered filed and the action of the President was approved, ratified and confirmed.

Agreem't with S. P. Co. to Pay $5,000 Rent for Piers 42 & 44 to Aug. 1st, 1906. R. P. Schwerin's letter

President Spear also presented an agreement with the Southern Pacific Co. wherein it was agreed that in consideration of its being granted the use of Piers #42 and 44 for three months from and after May 1st, 1906, it would pay to this Board the sum of $5,000.00 bonus promised to Healy, Tibbitts & Co. for the completion of Piers 42 and 44 in two weeks from April 29th, 1906. Said bonus to be paid as rental of said piers 42 and 44 to Aug. 1st, 1906. Accompanying same is a letter from R. P. Schwerin, Vice President and Gen'l Mgr. Pac. M. S. S. Co. consenting and agreeing to the renting of said piers to the S. P. Co. for three months from May 1st, 1906.

They were ordered filed and the action of the President was approved, ratified and confirmed.

Healy, Tibbitts' Bill for $5,000 Bonus Allowed

Healy, Tibbitts & Co. present Bill for $5,000.00 bonus for completion of Piers 42 & 44 as before mentioned. The Southern Pacific [fol. 91] Co. having entered upon the occupancy of same as above mentioned the Bill was allowed and ordered paid and the Secretary

was directed to present Bill to S. P. Co. for said bonus as rent in accordance with the agreement therefor.

On motion of Mr. Mackenzie seconded by Mr. Spear, the Board adjourned subject to the call of President Spear.

Attest: John M. Foy, Secretary.

I hereby certify that the above is a true and correct copy of the minutes of the meeting of the Board of State Harbor Commissioners held May 18th, 1906, Volume 17, pages 146 and 147.

James Byrne, Jr., Asst. Secretary. (Seal.)

It is agreed by counsel of the respective parties that if James Byrne, Jr., were called as a witness he would testify that he resides in San Francisco, California, that he is now, and has been since 1905, assistant secretary for the Board of State Harbor Commissioners of the State of California; that the minutes of the said board as copied above, were taken from the official records, of which he is in charge; that he personally remembers the fact that the transaction of the board recited in said minutes actually took place, and that he would testify further, as follows:

"I am Assistant Secretary of the Board of State Board of Harbor Commissioners having control of the harbor front of the City and County of San Francisco; I was Secretary in 1906; prior to the San Francisco fire of April, 1906, the Healy-Tibbitts Construction Company commenced the construction of piers 42 and 44 located on said harbor front and, at the time of said fire, said piers were [fol. 92] about completed, with the exception of the deck of wood; shortly after the fire, and during the month of May, 1906, said Board granted to the Southern Pacific Railroad Company the right to occupy and use said piers and during the months of May, June and July of 1906, the said company commenced its occupancy and use of said piers; I annex hereto and make a part thereof, a copy of the minutes of a meeting of said Board, held on the 18th day of May, 1906, and relating to the use of said piers by the Southern Pacific Company."

CHARLES C. HORTON, the first witness, being first duly sworn, replies to question of counsel as follows:

By Mr. Barton:

Q. 1. Are you the Charles C. Horton who gave a deposition in this cause May 26, 1921? I call your attention to the printed deposition.

A. I am.

Q. 2. I call your attention to a certified copy of the minutes of the Board of State Harbor Commissioners dated May 18, 1906.

In that paper there is a reference to your company having been paid a bonus for the completion of piers 42 and 44, the same piers which were referred to in your deposition which is printed. Will you go on and state what the facts are with reference to the completion of that job, and the payment of the bonus referred to?

A. On account of the fire of April, 1906, it was necessary for the Southern Pacific Company to have additional storage space, and we made an agreement with the Board of Harbor Commissioners to allow them the use of the warehouses on piers 42 and 44 previous [fol. 93] to completion and acceptance, with the understanding that we would be paid $5,000 to cover the extra cost of completion while occupied.

Q. 3. And did you go on and complete that job as stated in this certified copy of the minutes?

A. We did.

Q. 4. And what was the date of the completion of that job, that is to say, piers 42 and 44?

A. I cannot fix the exact date without reference to the records of the Harbor Commission, but it is about June, 1906.

Q. 5. And what do we understand by completion? Was all your work done with respect to the placing of concrete?

A. Our work was entirely finished and all the concrete was placed.

Q. 6. What is the deck of a pier of that kind?

A. You mean the interpretation of the word deck?

Q. 7. Exactly.

A. It is the floor of the pier.

Q. 8. What is the superstructure?

A. It is the shed above the floor of the pier.

Q. 9. Was the shed a part of your contract?

A. It was.

Q. 10. And when was that completed?

A. As I have previously testified. I mean the shed was a part of the contract and everything was finished about June, 1906.

Q. 11. The shed was of wooden construction?

A. It is a wooden frame and wooden exterior.

Q. 12. You have in your previous deposition referred to the placing of the concrete by means of a barge, on which was a tower, etc. Can you state whether the placing of the concrete was all finished prior to the earthquake and fire?

A. It was all finished—there may have been a few odds and ends to do, that's all.

[fol. 94] Q. 13. This suit has been on hearing, I am informed, at Philadelphia, and at that hearing one Frederick E. Engstrum was examined as a witness for plaintiffs. I call your attention to his deposition, particularly to his answer to questions 24 to 32. Have you read those questions and answers?

A. I have.

Q. 14. State if you know what the facts are as to the Healy-Tibbitts Company employing the Concrete Appliances Company or the Parrott Company to design such apparatus as is referred to by Mr. Engstrum?

By Mr. Hood: Question objected to as assuming. There has been no testimony that either of said companies was "employed."

A. I know that the Healy-Tibbitts Construction Company did not pay the Concrete Appliances Company or Parrott Company any royalty. I do not know, however, whether these people upon their own initiative prepared drawings of the concrete barge distributing plant in order to secure business from it. This is very often done, and it may have happened in this case.

Q. 15. Will you state whether, to your knowledge, the Healy-Tibbitts Construction Company has paid royalties to anyone on account of any such concrete placing apparatus as you have described, and as is described in the Engstrum testimony?

A. We have paid no royalties unless it is included in the quoted price of equipment of this kind that we have bought.

Q. 16. I'll ask you the broad question as to whether you or the Healy-Tibbitts Construction Company ever recognized as valid the patent in this suit, which relates to placing concrete by a tower and a pipe controlled by a boom?

[fol. 95] By Mr. Hood: Question objected to, as it does not appear that this witness has any knowledge of the particular patent in suit.

A. The matter has never been brought to our attention one way or the other.

Q. 17. Is it a fact that since the Healy-Tibbitts Construction Company used the barge and apparatus that you testified to in your previous deposition that you have gone ahead as occasion required and built or bought concrete-placing apparatus of that type; that you are now using such apparatus, which includes a tower, a trough or pipe for conveying the concrete, a boom for controlling the said pipe, and the usual apparatus that goes with such an outfit?

By Mr. Hood: Question objected to as assuming alleged facts which have not been proven; as leading; and as immaterial, because the structure defined by the question is incomplete.

A. One unit of our equipment consists of a concrete distributing plant on a barge, which is equipped with the Insley distributing trough, boom, etc.

Q. 18. Is it a fact that you have used such apparatus right along since 1906, varying possibly as to details?

By Mr. Hood: Last objection repeated.

A. This particular barge that I refer to was not built until about five or six years ago, and has been used off and on since then.

Cross-examination (without waiver of objection) by Mr. Hood:

X Q. 19. You are not prepared to say that neither Mr. Engstrum nor the Parrott Company negotiated with the Healy-Tibbitts Company with the idea of attempting to interest the Healy-Tibbitts Com-

pany in the use of a concrete distributing apparatus which would [fol. 96] embody a barge, a tower, a hopper vertically adjustable on the tower, a boom, pivotally supported on the tower in such manner that it could be swung from side to side and also in such manner that it could be moved up or down on the tower at its pivot point, so as to maintain a desired relationship with the hopper, a chute associated with the hopper in such manner as to receive the hopper discharge, and supported by the boom, so that the chute would swing from side to side as the boom was swung, and the hoisting bucket mounted in the tower so as to raise mush concrete from the bottom of the tower and dump it into the hopper, are you?

A. Do I understand from your question that you want to know whether Engstrum or the Parrott Company ever took up with us the purchase or use of the plant as described above? Is that the question?

X Q. 20. Yes, in substance, although my question as to whether or not you are prepared to deny that said negotiations were had.

A. Quite on the contrary. I believe they did discuss this matter with us.

X Q. 21. And at that time your company when distributing or laying concrete at quite some distance from the mixer or hoisting apparatus, was delivering the concrete from the hoisting apparatus into a hopper and from a hopper into wheelbarrows and then wheeling the concrete to the distant point?

A. Not in wheelbarrows, but in ore cars; that refers only to part of the work.

X Q. 22. That is the case wherever the concrete was being laid at a point say more than a few feet away from the hopper discharge?

A. Generally that was the case. Yes.

X Q. 23. Now isn't it a fact, Mr. Horton, that at the time of those [fol. 97] negotiations it was a new proposition with your Healy-Tibbitts Company to consider the idea of chuting a very wet mix for a considerable distance from the hopper through chutes, to a point of deposit a considerable distance from the hopper?

A. I would say it was to chute the mixure a considerable distance, yes.

X Q. 24. Your testimony which was previously given in this case relative to the precise character of the chuting apparatus which you describe in your previous testimony, was given from memory, both as to the character of the apparatus and the time of its use, is that right?

By Mr. Barton: I suggest that counsel for plaintiffs refer to the particular testimony which he may have in mind.

By Mr. Hood: May counsel for plaintiffs understand that the witness at the present time is to be considered as having affirmed the deposition which he has previously given in the case?

By Mr. Barton: My point is that the witness has the privilege of knowing just what part of his deposition is referred to. A general question like that is hardly fair to the witness, or may not be. That is all.

By Mr. Hood: The witness is shown a printed copy of the pre-

vious deposition in response to the request of counsel for the defendants.

A. I have tried to make it clear throughout my previous depositions that I do not consider myself competent to give any detail in reference to any individual part of the concrete mixing plant in question. This is due to the fact that many years have elapsed during which time other propositions have come up, and I have forgotten the detail of construction of the outfit in question. Further than this I am not an outside man, and did not come in daily con- [fol. 98] tact with the rig in question while operating, and therefore have only a general knowledge of what took place.

X Q. 25. Then it might even be that the apparatus which you attempted to describe in your previous deposition is not in fact accurately described by you?

A. I would say that the apparatus previously described is subject to the mistakes that may arise in the man's memory concerning something that took place fifteen or twenty years ago.

X Q. 26. And it might even be that this barge apparatus, whatever its construction may have been, which you had in mind at the time of your previous deposition, might have been used for the first time in connection with the construction of pier 38 instead of in connection with the construction of piers 42 and 44. Is that right?

A. Well, I wouldn't quite say that, although fifteen or twenty years' time, anything is possible. One job followed the other pretty closely—a few years apart.

X Q. 27. Mr. Robert Tibbitts was the Tibbitts of the Healy-Tibbitts Construction Company during the time when piers 42, 44 and 38 were being constructed, was he not?

A. He was.

X Q. 28. And he was the outside man who had the direct superintendence of actual construction work on these piers, wasn't he?

A. To the best of my recollection he was.

X Q. 29. Do you think it likely that his recollection as to the precise character of apparatus which was used in constructing each of those piers and the time when such apparatus was first used would be more likely to be correct than yours?

A. Well, I wouldn't say any more correct than mine, no. We are either one likely to make a mistake on it.

[fol. 99] X Q. 30. If Mr. Robert Tibbitts should testify that during the construction of piers 42 and 44 the concrete was wheeled from a mixer which was on shore and dumped into the cylinders, and that no tower or barge apparatus was used on those two piers, would you be inclined to believe that perhaps you had made a mistake in your recollection?

A. Part of the job was poured that way, but the outer end of the job was poured from a barge.

X Q. 31. Is it a fact, Mr. Horton, that during the period of 6 or 8 years, beginning say 1904 or 1905, the Healy-Tibbitts Company was engaged in building a very considerable number of piers?

A. They were.

X Q. 32. And there were times when they had several of those piers under construction at one time, in various stages of construction, and shortly after the completion of one they'd begin the construction of another?

A. That has been the program since 1904 up to about 1918. We always had one or more piers under construction.

X Q. 33. It would be pretty easy to become confused as to the character of apparatus that was used in connection with any particular pier, wouldn't it?

A. It surely would.

X Q. 34. And as I understand it you were not intimately connected in the actual construction operations at piers 42 and 44, were you?

A. I was not in charge of any of the construction. My work did not include that part of the business.

X Q. 35. That was Mr. Robert Tibbitts' job?

A. The actual supervision was up to Tibbitts.

X Q. 36. The only concrete work on piers 42 and 44 was the cylinders, and the decks were steel frame work covered wooden planks. Is that right?

[fol. 100] A. That is about right. I think there was some concrete along the railroad track construction, some special beams.

X Q. 37. I suppose you don't know then the particular character of concrete that was used, or whether or not it was tamped in place?

A. I don't believe there was much tamping done. The concrete cylinders that were built in piers 42 and 44 have since failed and been removed. Creosoted piles taking their place. When removing these cylinders the exterior wooden form having been eaten away the concrete was exposed, and it appeared to be very porous, indicating very little if any original tamping.

X Q. 38. That porous condition would also indicate a very dry mix, would it not?

A. It would, yes.

X Q. 39. I understood you to say that several years ago your company purchased Insley Distributing Apparatus for distributing concrete, embodying a tower, a vertically adjustable hopper, with a discharge gate, a hoisting skip, a boom pivoted to the tower and mounted so that it could be raised and lowered to maintain it's position relative to the hopper, and a chute supported by the boom and connected with hopper to receive the hopper discharge,—that's right, is it?

A. That is correct.

X Q. 40. And at the time you purchased that apparatus from the Insley representative something was said about the apparatus being covered by patents, wasn't there?

A. The original equipment was purchased from Lindgren Company, general contractors here, but since then we have purchased extensive repair parts, and the representative of the Insley Com-

[fol. 101] pany, has told me on several occasions that the process was patented,—I mean the apparatus

X Q. 41. This apparatus that you purchased from Lindgren Company was known to be Insley equipment, wasn't it?

A. Oh! absolutely.

X Q. 42. And at the time you purchased it you understood that it was covered by patents, didn't you?

A. My information with reference to this equipment has been that there was a royalty charged on the number of yards placed by this apparatus. I don't know whether I am right about this, but this is what I have always understood.

X Q. 43. Well, you understood that the apparatus that you got from Lindgren was patented apparatus?

A. I knew it.

X Q. 44. If, as you say, a barge apparatus was used to place some of the concrete in some of the outer cylinders of piers 42 and 44, the barge was brought up close to the cylinder, and the pipe from the hopper run down almost straight, so as to discharge into the forms, didn't it?

A. That is my belief now, yes. If it was used to put concrete in a cylinder away from the edge of the barge it may have been that they used a temporary boom of some sort, but in thinking this over I think the outfit we used at that time was very crude.

X Q. 45. As a matter of fact, if the concrete was a very dry mix it couldn't be discharged through a spout or chute, unless that chute was almost vertical, could it?

A. Well, the chute would be almost vertical because I don't think it was ever attempted to spout beyond the second row of cylinders, which would not be over 16 feet inside the face of the dock. Beyond that I would say upon thinking it over that the concrete was spouted [fol. 102] from the vertical pipe to a hopper on the dock and then bucketed to the interior cylinders.

X Q. 46. Then you think that in giving your previous testimony it is possible you may have been confused by later developments and that actually the barge apparatus didn't have that rather flatly inclined chute, supported by the upwardly inclined boom, as shown in the sketch that you had prepared, the boom extending considerably beyond the chute and having a block and tackle suspended from it and supporting the chute?

A. It is possible that that applied to a later job.

X Q. 47. Mr. Horton, do you recall that several years ago Mr. C. A. Garfield, who handles the Insley equipment in this territory, came to see you and tried to interest you in an Insley equipment that was to be placed on a barge, and you expressed some surprise to Mr. Garfield that it would be possible to put such an apparatus on a barge without being top heavy?

A. I remember it perfectly.

X Q. 48. And you were considerably surprised at Mr. Garfield's confidence that an apparatus for chuting concrete for considerable distances from the barge by means of a boom supported chute, a tower, hopper, and a skip, could actually be erected to be a satisfactory piece of apparatus?

A. I was surprised at what Mr. Garfield claimed for his equipment.

Thursday, February 2—2 p. m.

Redirect examination by Mr. Barton:

R. D. Q. 49. From your testimony I assume that your belief as to the time when the barge was used with the boom in constructing [fol. 103] piers 42 and 44, is not so positive or definite as it was at the time you gave your deposition last May, or even at the time when you made an affidavit, which was sworn to, as I recall the first of December last. I will ask you if such is the case if you will state why you feel the uncertainty as to the dates you testified to in your previous depositions? What has occurred?

By Mr. Hood: That portion of the question including the reference to a "boom" is objected to, as not warranted by the testimony, in view of the fact that the witness, on cross-examination has stated that the early apparatus which he had in mind did not contain a boom.

By Mr. Barton: The testimony will show for itself; my memory is that there was no doubt in the mind of the witness at the time he gave his previous deposition about there being such apparatus on the barge as I have referred to in my question and at that time.

A. My mind is more open on the subject now than it was when Mr. Barton originally took it up with me. At that time question of the use of an outfit of this kind had been dormant for 15 or 20 years. Since this case has been brought to my attention I have talked to my associates, and other men who were engaged in the construction of the piers in question, and their versions are so conflicting that in justice to all concerned I want to now say that I am in doubt as to the exact character of the concrete distributing plant that was used on piers 42 and 44.

R. D. Q. 50. You remember that a barge was used there?

A. It is my belief that a barge was used on part of the work.

R. D. Q. 51. And is there a picture in your mind of a barge being used at that time? That is, looking back do you now seem to remember such a barge?

[fol. 104] A. If my company had built only piers 42 and 44, I would say definitely that the barge was used, but since we have had in continuous construction other piers it is hard for me to say definitely the exact kind of equipment used on this specific work.

R. D. Q. 52. I show you Defendants' Exhibit No. 61. It is a blue print and has certain legends written on it. Do you remember the circumstances of the making of the tracing from which this blue print is taken?

By Mr. Hood: The objections previously entered relative to Defendants' Exhibit No. 61 are here repeated.

A. The blue print in question is a reproduction from memory of a concrete barge plant used by my company.

R. D. Q. 53. And who made the sketch,—who directed it?

By Mr. Hood: It is agreed that the objections heretofore entered relative to Defendants' Exhibit 61 shall be considered as entered, without repetition, to all questions and answers in the direct examination of this witness.

A. The sketch was made in the drafting room of our company by one of our engineers, and the data was furnished by myself and our superintendent, Mr. Brown, and represents the equipment we have owned at various times in the past 20 years.

R. D. Q. 54. In your affidavit which I have referred to I note that a reference is made to this drawing. This blue print being lettered in red chalk. The lower portion of the left-hand figure of Fig. 2 being marked "A," and the right-hand portion, at the pivot of the boom being marked "B." With this in mind I ask you to refer to the affidavit of December 1st, and after doing so will you state whether the statements of facts appearing therein were believed by [fol. 105] you at the time, that is December 1st last? For convenience, I copy the affidavit into the record as follows:

"In the District Court of the United States, Eastern District of Pennsylvania

"In Equity. No. 2067

"Concrete Appliances Company et al., Plaintiffs,

v.

John E. Gomery et al., Defendants

"Affidavit of Charles C. Horton on Behalf of Defendants

"State of California,
"City and County of San Francisco, ss:

"Charles C. Horton, being first duly sworn, deposes and says:

"I am the same Charles C. Horton who heretofore testified in the above-entitled cause in May, 1921, at San Francisco;

"My attention has been directed to certain testimony purported to have been given respectively by Messrs. Frank I. Ginsberg, Frederick E. Engstrum and William H. Insley during the trial of the above-entitled cause in Philadelphia during the month of October, 1921;

"With regard to the subject-matter of this testimony, the following are the facts to the best of my knowledge and belief:

"In said testimony, I note that it is contended the inclined concrete distributing pipe, forming a part of the concrete distributing apparatus used by the Healy Tibbitts Construction Company in constructing Piers 42 and 44 as herein testified to by me in May, 1921,

[fol. 106] would say and be inoperative; such contention is refuted by the fact the said apparatus, embracing the said inclined pipe, as illustrated in the sketch, Ex. 61, referred to by me in my said testimony, did operate and was used successfully in carrying on the said construction work during the years 1905 and 1906; the said pipe was composed of sections, each section inserted into an adjoining section with a tight fit between adjacent sections which were held together by chains; in respect to the said sketch, so referred to by me at the time I testified herein, I now note that the same is inaccurate in regard to following details and such inaccuracies no doubt were due to the haste with which said sketch was originally prepared; in such sketch, the lower end of the boom, in figure 1, should be shown, as fastened on top of the horizontal 8 x 8 stick with the vertical pin as illustrated in figure 5 of the sketch; also, the attachment of the boom to the 8 x 8 stick in figure 2 should be reversed as shown; the sideways movement of the boom is around pin A and the vertical movement around pin B; the general lowering and raising of the boom was accomplished by moving the 8 x 8 stick up or down on the side of the tower fastened to the posts by the bolts A, shown in figure 3;

"Regarding the testimony of Mr. Engstrum in respect to the Healy Tibbitts Construction Company having any designs prepared by Parrott & Co. or to the payment of royalties to that company, I am quite certain he is mistaken; if any such transaction occurred, I was in a position to have knowledge thereof, and I am certain that no such designs or drawings were made by Parrott & Co. for my company and that no royalties were ever paid by the Healy Tibbitts Construction Company to Parrott & Co.; I have had the books of the Healy Tibbitts Construction Company examined for the purpose of confirming my own recollection and such examination failed to disclose any such transaction with Parrott & Co.: [fol. 107] it is probable that Mr. Langdon E. Boyle, as the representative of Parrott & Co., endeavored to interest the Healy Tibbitts Construction Company in the concrete appliances handled by his firm during the years 1912 and 1913 but I am certain he was unsuccessful and that the Healy Tibbitts Construction Company never had prepared by Parrott & Co. any designs and never used any designs made by that company and relating to concrete distributing apparatus; I have discussed, with my associates in my own company, and also with Mr. Boyle, formerly of Parrott & Co., the possibility of the occurrence of any such transactions, and their recollections and knowledge confirm my own recollection and the statement of facts above set forth;

"Regarding Mr. Ginsberg's testimony, it is quite possible he never saw and knew nothing of the concrete distributing apparatus employed by my company in the construction of piers 42 and 44 and heretofore described by me; he was never employed in connection with the work carried on at the docks but worked as a foreman of concrete constrction work on one or two building contracts located in the business section of San Francisco and distant from such docks; therefore, there was no more reason for him to know what the Healy Tibbitts Construction Company was doing on the water front or at

any other place than there was for him to know what some other company was doing at some place distant from the particular jobs on which he worked.

"Charles C. Horton.

"Subscribed and sworn to before me, this 1st day of December, 1921. E. R. Conway, Notary Public."

[fol. 108] By Mr. Hood: The question is objected to as wholly improper examination. The affidavit is not in evidence; there is no indication as to the circumstances under which the affidavit was prepared, or whether or not the witness had any more to do with it than to merely sign the same, or whether in fact he did sign it; if the witness did sign the affidavit then the question is grossly leading in character because it is an attempt to put in the witness's mouth a desire to answer.

A. The only uncertainty in my mind at this time is whether the apparatus described in the affidavit referred to and also Exhibit 61 was the same as was used at piers 42 and 44. During the time that has elapsed since then my company has owned four such plants. Our records having been entirely destroyed in 1906, we have nothing to refer to as to the use of the equipment described on those piers, and as previously stated, conflicting statements by men intimately associated with the work has cast a doubt in my mind as to whether the particular equipment as described was used.

R. D. Q. 54. But according to your best memory, I understand that you not only believed, but still believe that your statements in your previous deposition were correct as to the structure in question and as to the time when used.

By Mr. Hood: Question objected to as grossly leading; as being a statement of alleged fact exactly contrary to the present testimony of the witness; and an apparent effort to cross-examine the witness rather than to directly examine him.

A. I am reasonably sure that a barge was used on part of the concrete work, but I am not sure that the boom attachment and other later improvements were a part of the equipment at that time.

[fol. 109] Recross-examination by Mr. Hood:

R. X Q. 55. Did you dictate or personally prepare the affidavit which has been copied into the records as part of R. D. Q. 53 propounded to you in this examination?

A. No, sir.

Re-redirect examination by Mr. Barton:

R. R. D. Q. 56. Did Mr. W. K. White, a patent lawyer, with office in this building, prepare the affidavit for you and go over it with you in detail?

By Mr. Hood: Objected to as irrelevant and immaterial.

A. As I recall it Mr. White called at my office, did talk over what had taken place in court in the East, and returned several days later with the affidavit, which I read over and signed.

R. R. D. Q. 57. You knew, did you not, that the affidavit was of importance, and you expected that it would be filed in court, as it was?

A. A great deal of the uncertainty that has arisen as to my testimony in this case has been created quite recently, due to conversations with men interested in the construction in question since I knew further testimony was going to be taken, it being my aim to, as far as possible, to get at the real facts.

R. R. D. Q. 58. You mean since last December 1st?

A. In the last two or three weeks.

R. R. D. Q. 59. I understand then that you gave Mr. White the data for the affidavit, that he subsequently brought it to you, he having formulated it, and that you understood what was stated in the affidavit when you signed it, and that you believed all the facts set forth therein were correct?

[fol. 110] By Mr. Hood: Objected to as irrelevant and immaterial.

A. I don't believe I gave Mr. White the facts. He was apparently well informed as to what had gone on in court, and discussed particularly the statements made by Engstrum and Ginsberg and the Parrott Company regarding collecting royalties from my company. This I knew to be incorrect, and it was at my suggestion that he went to Parrott and Company and I understand secured additional affidavits from their employees and a Mr. Boyle, a former employee, bearing out my contention.

R. R. D. Q. 60. But you knew what you were swearing to when you signed the affidavit?

By Mr. Hood: Objected to as improper direct examination.

A. I read the contents of the affidavit, and at that time believed the contents to be true.

(Deposition closed.)

Chas. C. Horton.

Fred L. Ayer, the next witness, having been duly sworn, testified for defendants as follows:

By Mr. Barton:

Q. 1. Are you the Fred L. Ayer that gave a deposition in this cause last May?

A. Yes.

Q. 2. At that time you referred to a certain sketch, a blue print of which is before us marked 61. Referring to that sketch you will see a pipe indicated, with the legend: "Flexible joints held together by chains." I ask you to state what was the length of those joints as used in the barge concrete apparatus to which this sketch refers?

A. An average of 6 feet long and 8-inch pipe.

[fol. 111] Q. 3. I'll ask you if you have confirmed these dimensions at any time, and if so when?

By Mr. Hood: Question objected to as calling for a statement of conclusion.

A. Well, I went and looked at the pipe again today, and I see the pipe is the same as was used on the concrete barge.

Q. 4. Now state how that pipe was fitted together? How did the sections articulate with one another?

A. Slip joints, I would say, the same as stove pipe, one joint slipped into another.

By Mr. Hood: Objected to as not the best evidence.

Q. 5. And what can you say as to the rigidity or flexibility of the pipe as thus put together?

A. Well, being in slip joints, one joint in the other four to six inches it makes it very easy to move around. It is on a hinge here (the witness points to the upper joint of the pipe which connects with the hopper).

Q. 6. Do you remember who fitted the boom, or helped fit it?

A. I did it myself.

Q. 7. Describe just what the fittings were?

By Mr. Hood: Question objected to on the ground that the witness has before him Exhibit 61.

A. There is a regular boom fitting, straps on each side of the boom, at the foot of the boom, which sets in a socket which doesn't show on here, fastened by a bolt, which makes it easy to revolve. The outer ends are rigged with blocks and tackle. Block and tackle is right. I have been doing it all my life.

Q. 8. State if you remember about how far the pipe extended from the tower in connection with your work of placing concrete in the cylinders?

A. Well, that depends on how close you are to the ones filled. You can fill off 30 to 40 feet from the shore, depending on the [fol. 112] distance we get from the edge of the wharf.

Q. 9. And how did you move the pipe when you wanted it to extend 30 or 40 feet?

A. By the use of the boom.

Q. 10. You remember, do you, working on piers 42 and 44?

A. Yes, sir.

Q. 11. And you recall the barge with the mixer, the skip, the hopper, the pipe, the gate at the hopper and the boom pivoted to move up and down or horizontally?

By Mr. Hood: Question objected to as grossly leading.

A. I do.

Q. 12. Describe a little more fully how the pipe was connected at the hopper so as to permit of the moving of the pipe by the

boom? You may if you wish make a little sketch of the connection at the hopper.

A. It is an easy matter to explain. The first joint of pipe connecting with the hopper is a little larger than the following one, so as to give plenty of play in any direction.

Q. 13. You remember a joint of pipe that you got for me. It was put in evidence as No. 62. Where did that particular joint come in the actual apparatus?

A. It came at the upper end of the pipe which carried the concrete to the cylinder.

Q. 14. And it was just below the gate of the hopper, was it?

By Mr. Hood: Question objected to as assuming a gate structure which has not been proven. The question is also objected to as leading. Counsel for plaintiff protests against leading questions and insists that the witness be examined properly.

A. Yes, sir.

[fol. 113] Q. 15. And was there a gate operated by a lever at the hopper?

By Mr. Hood: Objected to as leading.

A. There was.

Q. 16. How did the first, or upper regular section of pipe connect with this tapering piece that came next to the hopper? Was it a loose fit or a tight fit?

A. A loose fit joint.

Q. 17. A loose fit joint?

A. Yes, sir.

Q. 18. And was that loose enough so as to permit the pipe to be moved at that joint?

A. It was.

By Mr. Hood: Objected to as leading.

Q. 19. The lower joints of the pipe were different in construction from this upper or tapered section which came next to the hopper, is that correct?

By Mr. Hood: Objected to as grossly leading.

A. They were, the short joint was about 2 feet long, and the other joints averaged 6 feet.

Q. 20. And was the pipe as a whole stiff enough to be moved together by the boom, with the connection between the short piece at the top and the next piece loose enough to act as a pivot?

By Mr. Hood: Objected to as grossly leading.

A. They were, yes, sir.

Q. 21. Please describe something in detail, how the mush or aggregate was gotten into the cylinders? What apparatus, if any, was at or in the cylinder? How did you fill the cylinders?

By Mr. Hood: Question objected to as assuming a fact not proven, in view of the technical use of the term "mush" which has been had in this record.

A. You mean the concrete from the hopper? There is a flexible pipe with joints set down in the cylinder with a little hopper [fol. 114] at the top of it, that is at the top of the cylinder, and the pipe which is carried by the boom lands the concrete in the top of this little hopper, and as the cylinder fills up from the bottom the pipe is raised and joints taken off.

Q. 22. Before beginning to fill a cylinder, then, you put a pipe into it and how large a pipe did you use in the cylinder below the little hopper that you said was placed at the mouth of the cylinder?

A. An 8-inch pipe.

Q. 23. And you could and did move the pipe carried by means of the boom to the little hoppers placed at the top of the cylinder?

By Mr. Hood: Question objected to as leading.

A. Yes, we moved those pipes with the same boom.

Q. 24. How deep were the cylinders, about?

A. From 40 to 60 feet.

Q. 25. How far down towards the bottom did the vertical pipes extend?

A. Well, generally about 30 feet to start with.

Q. 26. And about how far did you, in practice, move the chute or pipe in filling those cylinders? How far from the tower would it extend?

A. Thirty to forty feet.

Cross-examination (without waiver of objections) by Mr. Hood.

X Q. 27. In your direct examination you said that you had recently inspected some pipe sections about 6 feet long. Am I to understand that these sections that you inspected were the very same sections that you say were used on the apparatus which you say was used in connection with building piers 42 and 44 or were they just sections which, according to your memory, were like the sections of the old apparatus?

[fol. 115] A. I couldn't say postively they were the same ones, but they were the same style and they were very old so I presume they were some of the same ones.

X Q. 28. Well, after a pipe of that kind has been used four or five years it looks pretty old, don't it?

A. Yes.

X Q. 29. And after 4 or 5 years' use you couldn't tell with any degree of accuracy whether it was 5 years old or 10 years old or 15 years old, could you?

A. No.

X Q. 30. Now you worked for the Healy-Tibbitts Construction Company on a good many piers on the San Francisco water front, didn't you?

A. Yes, sir.

X Q. 31. Did you work for that company on piers 36 and 40?

A. I worked on 36—yes, sir, I did.

X Q. 32. Both on 36 and 40?

A. Yes, sir.

X Q. 33. Now, as I understand your testimony, you think that the pipe section which was offered in evidence as Exhibit 62, which is an eighth turn elbow, was used on the apparatus in connection with the construction of piers 42 and 44?

A. I do. I remember that very well.

X Q. 34. There were times when the apparatus which you have in mind was used to fill cylinders which were right close up to the barge and tower, weren't there?

A. Yes.

X Q. 35. And in that case the pipe made of the 6-foot sections extended down almost straight up and down from the hopper, that's right, isn't it?

A. Yes.

X Q. 36. Well, now, how could that be accomplished with that eighth turn elbow at the top?

[fol. 116] A. Because the first joint is 2 foot. The hopper is on a eighth turn, 45 degrees, then a 2-foot joint will allow it to go perpendicular. (The witness illustrated this by means of a lead pencil and cigarette, showing the angle.)

X Q. 37. Then it is your recollection that at the small, or lower end of this Exhibit 62, eighth turn elbow, there was a 2-foot pipe that had a flexible connection with the Exhibit 62?

A. Yes.

X Q. 38. And the upper or large end of Exhibit 62 was connected to the hopper by some chains, so that that Exhibit 62 was flexibly suspended from the hopper, is that right?

A. Yes, it is all flexible.

X Q. 39. Do you recall that on that Exhibit pipe No. 62 there were riveted to the sides some pieces of strap iron that had hooks on the upper ends?

A. I do.

X Q. 40. And those strap pieces looked as though they had been broken off at their lower end. Do you recall that?

A. At the time the exhibit was sent away, yes.

X Q. 41. Is it your recollection that when that piece of pipe, Exhibit 62, was actually used, those strap sections had hooks at their lower ends also?

A. Not right at the lower end.

X Q. 42. Well, those strap sections had hooks at the lower end of the straps, although the hooks were not right down at the lower end of the elbow, is that right?

A. Yes, that's right.

X Q. 43. And those lower hooks, which are not now on the exhibit, formed the support of some chains, by which the short 2-foot section was suspended, is that right?

A. That's right.

[fol. 117] X Q. 44. About how much of an angle of movement would the chain connection between the hopper and the upper end of Exhibit 62, permit?

A. Well, I'd say 18 inches to 2 feet from the bottom end of the pipe, that is to say, the bottom end of the pipe could be moved sidewise from 18 inches to 2 feet.

X Q. 45. You mean that the bottom end of the pipe, which you say was suspended from the boom, could be moved sidewise 18 inches or 2 feet because of the flexible chain connection between the upper end of Exhibit 62 and the hopper. Is that right?

A. No. Do you mean the top hopper or the lower hopper? There is two hoppers, one at the lower end of the pipe into the cylinders and one at the top of the pipe.

X Q. 46. There was a hopper which was carried near the upper end of the tower, is that right?

A. Yes.

X Q. 47. And this Exhibit 62 had its upper end connected by chains to the lower end of that hopper, that's right?

A. Yes.

X Q. 48. And then connected to the lower end of Exhibit 62 by a flexible connection formed with chains, there was this 2-foot section that you talked about?

A. Yes.

X Q. 49. And then connected in some manner to the lower end of that 2-foot section was a 6-foot section?

A. Yes.

X Q. 50. And connected with that 6-foot section was another 6-foot section, and so on for several sections?

A. Yes, sir.

X Q. 51. Now, about how many of those 6-foot sections were used, end to end, and supported by the boom?

[fol. 118] A. That depended on the distance we were from the cylinders, 6, 7, sometimes 8.

X Q. 52. About how many of those 6-foot sections were used end to end when you were putting concrete into cylinders which were right up against the barge?

A. I would say 4 or 5.

X Q. 53. So that there would then be a pipe from 26 to 32 feet long extending downwardly from the lower end of this elbow section, Exhibit 62, is that right?

A. Yes, very often we allowed that pipe to go right into the cylinder.

X Q. 54. Now, about how far, from side to side, could you swing the lower end of that section of pipe, due to the flexible chain connection between the upper end of Exhibit 62 and the hopper that was on the tower?

A. I want to get the right meaning. Do you mean from the top of the boom how much the lower end would swing? A radius of 30 to 40 feet. The more you wanted it to swing the more pipe you'd put on it.

X Q. 55. How many chains were there between the upper end of Exhibit 62 and the hopper that was on the tower?

A. Two, one on each side.

X Q. 56. That is to say those two chains were parallel to the face of the tower?

A. Supposed to be.

X Q. 57. Now, if you swung the pipe to one side, that would put all the weight on one of those chains and the other chain would become slack, wouldn't it?

A. Not necessarily.

X Q. 58. Why not?

A. Because there is one on each side.

X Q. 59. Now, Mr. Ayer, we'll assume that this wastebasket represents Exhibit 62, and I suspend it on the fingers of my two hands, as [fol. 119] though my arms were chains, one on each side, now that would be a representation of the way this section of pipe, Exhibit 62, was suspended from the tower hopper, is that right?

A. Yes.

X Q. 60. Now, if you swing the bottom of this basket to one side the upper side of the basket will rise on that side toward which the swing takes place, wouldn't it? That's right, isn't it?

A. Not necessarily, for the reason that we have it on a floating barge, and we move the barge to tip our pipe.

(The witness illustrated by gently turning counsel for defendants from side to side.)

X Q. 61. Do you recall that sometimes in the use of the apparatus which you had in mind, when it was desired to move the lower end of the pipe to one side, a rope was tied to the lower end, and a man pulled on the rope and held it, so as to hold the lower end of the pipe over to one side?

A. Yes, sir.

X Q. 62. And he would stand there and hang on to that line as long as the lower end of the pipe was desired to be off to one side, isn't that right?

A. No, when the pipe was placed in the hopper on the cylinder it stayed there.

X Q. 63. When the lower end of the pipe, in its laterally deflected position, was to remain, it was necessary to hang on to that lower end by some means, such as a line in the hands of an operator, or by being tucked in to the hopper in the upper end of the cylinder, unless the barge was turned as you turned me a moment ago when I had the wastebasket in my hands, that's right, isn't it?

A. If I understand you right it is.

X Q. 64. Will you please read X Q. 63, and see if you understood it correctly?

[fol. 120] A. Yes, that's all right.

X Q. 65. Now, the deck of piers 42 and 44 was made up of a grade of steel, and then wooden planking laid on that steel, is that right?

A. Yes.

X Q. 66. You've talked about some "cylinders." By that do you

mean the concrete pile, or the form in which the concrete was placed, or both?

A. By "cylinder" I mean the large cylinders 5 feet across to hold the concrete intact, some of them are wood and some of them are steel, and sometimes they have a pipe inside of them cut off, and sometimes it extends clear up.

X Q. 67. Then by "cylinder" you mean the cylindrical form into which the concrete was placed?

A. Yes, sir.

X Q. 68. In that work on piers 42 and 44 did they sink a caisson first, and, after clearing it out put the "cylinders" or forms for the concrete inside the caissons?

A. Part of them. We drove some of them without caissons. In some cases in working on piers 42 and 44 we sank a steel cylinder or caisson about 8 feet in diameter and long enough to extend down to hard-pan. Then we cleaned out the inside of this caisson and set our forms for the concrete down in these caissons and filled the forms with concrete. After the concrete was in the form, which as I have said was about 5 feet across, then we pulled the caissons, and this allowed the mud and silt to flow in around the bottoms of the forms which held the concrete. First the steel cylinder is driven, next it is pumped out free of water and mud, then there is a concrete foundation put in the bottom of the steel cylinder, large enough for the wooden caisson to set on top of it, then it is braced inside the steel cylinder to the outside of the caisson to hold it intact. Then the con-[fol. 121] crete is put in by use of the pipe and derrick. In shallow water we set or drive those wooden caissons right down near the shore and don't have to have a steel caisson.

X Q. 69. Is it your recollection that the same barge and tower apparatus which you have in mind is also used in placing the concrete in the cylinders for pier 38?

A. Well, I am satisfied it was, but I don't really recollect offhand now. There were so many of them. I think very likely it was, we always used them.

X Q. 70. As a matter of fact, it would be quite easy to become confused as to the particular apparatus that was used on any particular pier?

A. No, I am not confused.

X Q. 71. But you are not sure just what sort of an apparatus was used in building pier 38?

A. No, I don't recall it.

X Q. 72. Do you remember what kind of an apparatus the Healy-Tibbitts Company used in building pier 40 or pier 36?

A. We used the same gear.

X Q. 73. And you are just as sure of that as you are of the testimony you have given in connection with the apparatus that you say was used on piers 42 and 44, I presume?

A. Yes.

Redirect examination by Mr. Barton:

R. D. Q. 74. How are the 8-inch pipes put into the cylinders; what apparatus did you use?

A. We generally used the boom and derrick.

R. D. Q. 75. The boom itself was adapted to be used as a construction boom or a boom for handling pipes like that?

A. Yes.

[fol. 122] R. D. Q. 76. Do you know when piers 36 and 38 were built?

A. I believe they were started in 1906 and completed in 1907, to the best of my recollection.

R. D. Q. 77. Where were you from the time of the fire for the next year or so?

A. In San Francisco most of the time.

R. D. Q. 78. And were you employed by Healy-Tibbitts Company most of that time?

A. At intervals.

R. D. Q. 79. Didn't you tell me you were in the contracting business for a time? When was that?

A. I was, in 1906.

R. D. Q. 80. And on for a year or so?

A. Well, I'd say the biggest part of a year.

Recross-examination by Mr. Hood:

R. X Q. 81. What kind of a deck was there on pier 38?

A. Steel, wood and concrete.

R. X Q. 82. The wood was on top of the concrete and steel?

A. Yes, the steel first and then wood and then concrete.

R. X Q. 83. You mean that there was a wood floor put on top of the steel frame, and then concrete laid on top of the wood?

A. Yes.

R. X Q. 84. And how was that concrete distributed?

A. And most of the concrete was distributed by the boom device—well part of it, where it was handy.

R. X Q. 85. And I suppose at intervals between times when this barge apparatus was filling the cylinders it was delivering concrete for the floor up close to where the cylinders were being put on?

[fol. 123] A. No, we put on the deck and forms before we put any concrete floor on.

R. X Q. 86. That is, you got all your cylinders placed, then put on your steel frame on top of the cylinders, then built the forms for the concrete floor, and then put on your concrete for the floor?

A. Yes, sir.

R. X Q. 87. And you used the same apparatus which had previously been used for putting concrete in the cylinders, for placing some of the concrete for the floor, is that right?

A. Yes, sir.

R. X Q. 88. And you are as sure of that fact as you are of the correctness of your testimony relative to the apparatus which you think was used on piers 42 and 44, are you?

A. I know it.

R. X Q. 89. About how wide were those piers?

A. My recollection is they were about 80 feet.

R. X Q. 90. Well, if you could chute the concrete 40 feet by this apparatus which you have in mind, why didn't they place all of the floor concrete with this apparatus, working first from one side of the pier and then from the other?

A. We had it in use elsewhere part of the time from both piers. I remember very distinctly that we had a stationary mixer and concrete men wheeled it in in two wheeled concrete wagons part of the time. I remember very distinctly of concrete being wheeled in by concrete men because we had a union dispute between the concrete men and the Pile Drivers' Union.

R. X Q. 91. You have had a good many disputes of that kind, haven't you?

A. We have and they've mostly been settled satisfactory.

R. X Q. 92. Disputes between contractors and labor unions in [fol. 124] San Francisco have been a rather common occurrence in the last 25 years, haven't they?

Mr. Barton: Question objected to as irrelevant.

A. Not very serious disputes until the last 4 or 5 years.

R. X Q. 93. As you recall it the wheeling of concrete for pier 38 was from a mixer on shore, is that right?

A. I have not said anything about pier 38.

R. X Q. 94. About how wide was pier 38?

A. As near as I remember it's between 80 and 100 feet.

R. X Q. 95. What is your recollection as to how the concrete was distributed for the floor slab in pier 28?

A. Well, I believe the biggest portion of it was distributed by concrete men and wheel carts from a mixer on the dock.

R. X Q. 96. Is it your recollection that in building pier 38 the barge apparatus which you say was like Exhibit 61, was the only barge apparatus which embodied a tower and a hopper and a hoisting skip for concrete?

A. They might have had a temporary one, I don't just remember.

R. X Q. 97. That is you don't remember in connection with building pier 38 that they had more than one barge that had a tower on it, equipped with a hopper and a hoisting skip and a concrete mixer?

A. I do not remember that we had more than one at that time.

R. X Q. 98. And your memory is that the one barge-tower-mixer-structure which was used in building pier 38 was constructed like that which is illustrated in Exhibit 61?

A. Well, it might have been improved on a little mechanically [fol. 125] from the first one we had, but practically the same thing, they always improve a little on the second one.

R. X Q. 99. But it is your recollection that the apparatus which was used in constructing pier 38 had a boom and a boom supported sectional chute like that that is illustrated in Exhibit 61, that's right, isn't it?

A. I believe so, we had several temporary rigs with booms and pipes.

R. X Q. 100. But you only had one of such rigs at a time?

A. I believe they had two rigs at a time.

R. X Q. 101. Are you right sure about that?

A. I know we had two rigs, and I don't recall whether this rig of Exhibit 61, was working on pier 38 at the same time that the other one was.

R. X Q. 102. What was the construction of the other rig that you have just referred to?

A. Tower and concrete mixer and donkey engine on the barge, and boom and chute.

(Deposition closed.)

Fred L. Ayer.

By Mr. Barton: Commission closed.

IN UNITED STATES DISTRICT COURT

NOTARIAL CERTIFICATE

STATE OF CALIFORNIA,
City and County of San Francisco,
Northern District of California,
Southern Division, ss:

I hereby certify that on the first day of February, A. D. 1922, before me, Eugene P. Jones, a notary public in and for said State and county, and acting by consent as special examiner, at 419 Crocker Building, San Francisco, California, personally appeared, pursuant to notice and consent of counsel, between the hours of 10 o'clock A. M., [fol. 126] and 5 o'clock P. M., and on sundry days thereafter, the witnesses Charles C. Horton and Fred L. Ayer, of said San Francisco, and George P. Barton, Esq., appearing for plaintiffs, and Arthur H. Hood, appearing for defendants, and the said witnesses being by me first duly cautioned and sworn to testify the whole truth, and being carefully examined, depose and said as in the foregoing annexed deposition set out.

I further certify that said deposition was begun on the first day of February, A. D. 1922, and continued from day to day until the second day of said February, when the same was completed.

I further certify that the said depositions were then and there reduced to typewriting under my personal supervision and were after they had been reduced to writing subscribed by the said witnesses as their deposition in said cause, and that the same had been retained by me for the purpose of sealing up and directing the same to the clerk of the court, as required by law.

I further certify that the reason why the said deposition was taken was that said witnesses reside at San Francisco, California,

IN UNITED STATES DISTRICT COURT

PLAINTIFFS' EXHIBIT N.

PATENT IN SUIT.

128 – 129

L. CALLAHAN.

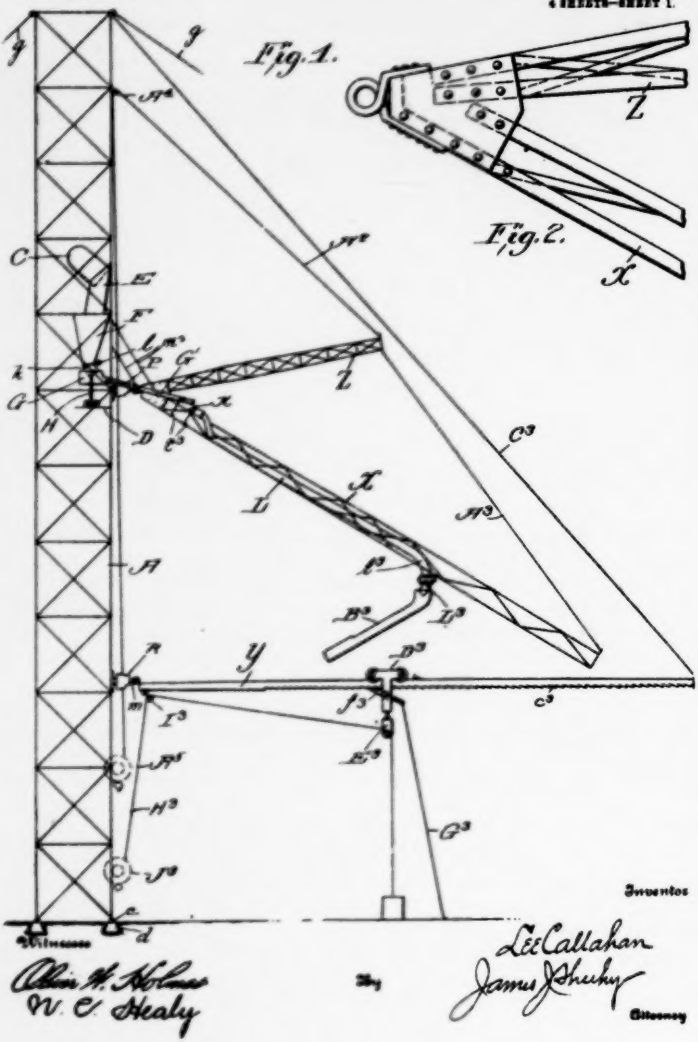
MATERIAL TRANSFERRING APPARATUS.

APPLICATION FILED JAN. 21, 1909.

948,719.

Patented Feb. 8, 1910.

4 SHEETS—SHEET 1.



L. CALLAHAN.

130–131

MATERIAL TRANSFERRING APPARATUS.

APPLICATION FILED JAN. 21, 1909.

948,719.

Patented Feb. 8, 1910.

4 SHEETS—SHEET 2.

Fig. 3.

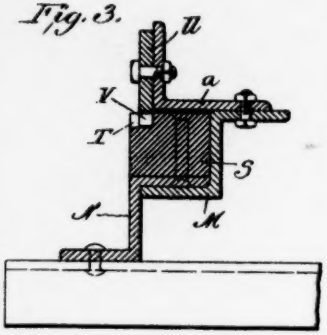


Fig. 3a

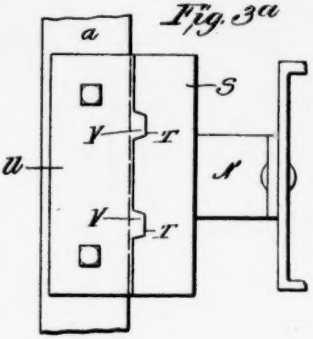
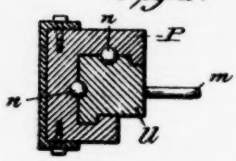


Fig. 4.



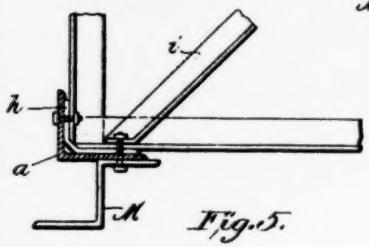
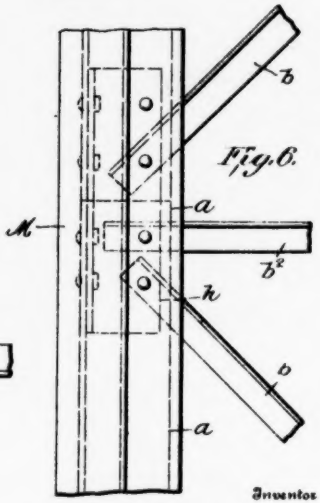


Fig. 5.

Fig. 6.



Witnesses

Alvin W. Holmes

W. C. Healy

Inventor

Lee Callahan

By James J. Shelby

Attorney

132 - 133

L. CALLAHAN.

MATERIAL TRANSFERRING APPARATUS.

APPLICATION FILED JAN. 21, 1909.

948,719.

Patented Feb. 8, 1910.

4 SHEETS—SHEET 1.

Fig. 7.

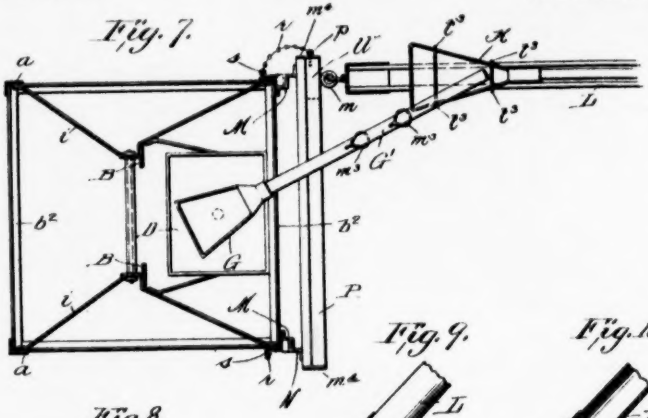


Fig. 8.

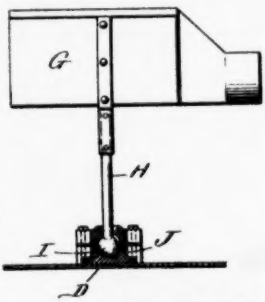


Fig. 9.

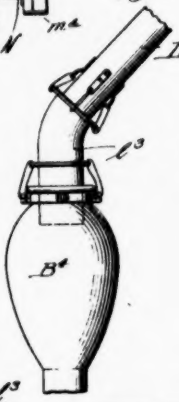


Fig. 10.

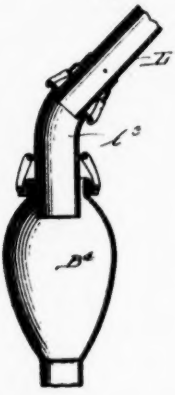
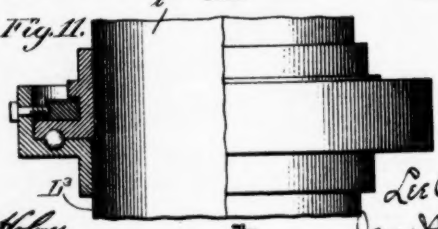


Fig. 11.



Witnesses

Allen W. Holmes

W. C. Healy

Inventor

Lee Callahan.

By James J. Healy

Attorney

L. CALLAHAN.

MATERIAL TRANSFERRING APPARATUS.

APPLICATION FILED JAN. 21, 1909.

948,719. Patented Feb. 8, 1910.

4 SHEETS—SHEET 4.

Fig. 12.

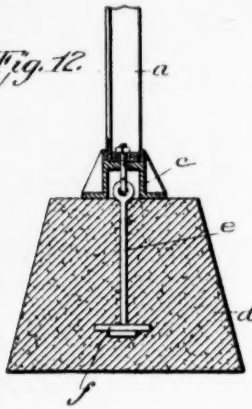


Fig. 13.



Fig. 14.

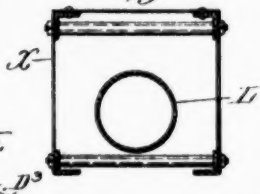


Fig. 15.

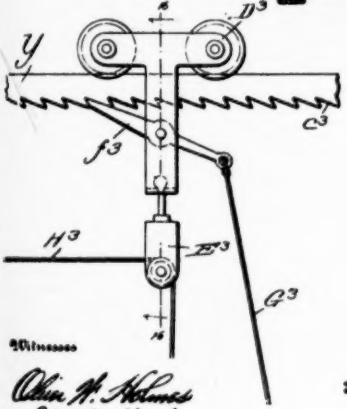
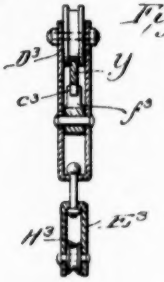


Fig. 16.



Witnesses

Allen H. Holmes

W. C. Healy

By

Inventor

Lee Callahan

James J. Healy

Attorney

UNITED STATES PATENT OFFICE.

LEE CALLAHAN, OF SAN DIEGO, CALIFORNIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CONCRETE APPLIANCES COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

MATERIAL-TRANSFERRING APPARATUS.

948,719. Specification of Letters Patent. Patented Feb. 8, 1910.

Application filed January 21, 1909. Serial No. 473,461.

To all whom it may concern:

Be it known that I, LEE CALLAHAN, a citizen of the United States, residing at San Diego, in the county of San Diego and State of California, have invented new and useful Improvements in Material-Transferring Apparatus, of which the following is a specification.

My invention pertains to apparatus for supplying materials to buildings in the course of erection; and it has for its general object to provide an apparatus calculated to be used to advantage in transferring concrete or other plastic material from a suitable source of supply to the points desired on a building that is being built.

Another general object of the invention is to provide an apparatus of the kind stated adapted more especially for use when a building is to embody reinforced concrete, and provided with means for transferring plastic material, and also with means for transferring other material from the ground to the points desired on a building in course of construction.

With the foregoing in view, the invention will be fully understood from the following description and claims when the same are read in connection with the drawings, accompanying and forming part of this specification, in which:

Figure 1 is a side elevation of the apparatus constituting the best practical embodiment of my invention of which I am cognizant. Fig. 2 is an enlarged detail view of the plastic-material boom with the conduit omitted. Figs. 3 and 3ª are enlarged detail views showing the manner in which the horizontal tracks are adjustably fixed at different points in the height of the tower. Fig. 4 is a cross-section showing one track and the arrangement of one boom-carriage therein. Fig. 5 is a detail horizontal section, and Fig. 6, a detail elevation of a part of the tower. Fig. 7 is an enlarged horizontal section of the tower. Fig. 8 is an enlarged detail view, partly in section and partly in elevation, showing one of the open pans of the apparatus and the support thereof. Figs. 9, 10 and 11 are enlarged detail views illustrative of conduit connections hereinafter referred to. Figs. 12 and 13 are enlarged detail views showing the manner in which I prefer to fasten the lower ends of the corner uprights of the tower. Fig. 14 is a detail cross-section showing the arrangement of the conduit in the plastic-material boom. Fig. 15 is an enlarged detail elevation of the carriage or traveler on the construction boom. Fig. 16 is a transverse section taken in the plane indicated by the line 16—16 of Fig. 15.

Similar letters designate corresponding parts in all of the views of the drawings, referring to which:

A is the fixed tower of my novel apparatus. The said tower may be of any general construction consonant with the purpose of my invention without involving departure from the same as claimed. I prefer, however, to construct the tower of suitable metal, and in twelve-foot, superposed sections, and to have it comprise corner uprights *a*, of angular form in cross-section, and inclined braces *b* and horizontal braces *b*', of similar form in cross-section, connecting the corner uprights in such manner as to make the tower of rectangular form in cross-section. I also prefer to fix the tower in position in the manner illustrated in Figs. 1, 12 and 13—that is to say, by arranging the corner uprights *a* of the lowermost section in seats *c* arranged on concrete bases *d*, embedded in the ground, and by connecting the lower ends of said uprights and the seats *c* through the medium of bolts *e* with anchors *f* held in the bases *d*. It will also be understood in this connection that guy cables *g*, Fig. 1, extending from the upper end of the tower to fixed objects located about the tower, may be and preferably are employed to assist in maintaining the tower in upright position.

The tower is increased in height as the construction of a building progresses by adding twelve-foot sections, and each added section is fixedly connected with the one below it, preferably through the medium of fish-plates *h* best shown in Figs. 5 and 6.

Arranged in the tower A and connected by struts *i* with the corner uprights *a* thereof, are upright rails B, Fig. 7, and at this point I would have it understood that when a section is added to the tower to increase the height thereof, sections will be added to the rails B to correspondingly increase the height of the same. The rails B are designed to coöperate with and guide a skip C,

the office of which is to hoist plastic material to a desired point in the height of the tower and there dump the same. The skip C and the means for raising and tripping the same are preferably, though not necessarily, of the type disclosed in the Letters-Patent of one Wallace, No. 830,385 of September 4, 1906, and I have therefore deemed it sufficient to show the skip alone diagrammatically herein. I would also have it understood that when desired the skip may be dumped by a man stationed on the tower at the point where the skip is to be discharged of its contents, without affecting my invention.

Removably arranged in the tower and suitably supported, preferably by resting on one of the horizontal braces and by being hung from struts *i*, is a floor or platform D, and suitably supported above said platform D is a chute E adapted to receive plastic material from the skip C, and a hopper F arranged to receive plastic material from the chute, which hopper F is provided with a contracted discharge *k* and a gate *l* through the medium of which the before mentioned attendant can control the passage of plastic material from the hopper F. Arranged below and adapted to receive plastic material from the discharge of the hopper F is an open pan G to which is fixed a support H, Figs. 1 and 8. The said support H terminates at its lower end in a ball I which is disposed in a complementary socket J on the floor or platform D, and hence it will be manifest that the contracted discharge pipe G′ slipped in or on the reduced end of the pan G may be pointed in various directions according to the points on the building at which the plastic material is to be delivered to forms, as hereinafter described in detail. The said pipe G′, which extends outside the tower A and is preferably supported by wires m^3, Figs. 1 and 7, or other suitable means, is positioned to supply plastic material to an open pan K suitably connected with a conduit L, hereinafter described.

Fixed to the tower A at points adjacent the two forward corners thereof and extending throughout the height of the tower are Z-bars M, Figs. 3 and 7, so termed because of their shape in horizontal section. These bars M are designed for the engagement of Z-shaped hooks N on horizontal, vertically adjustable tracks P and R which are arranged one above the other and extend across the front side of the tower. Each track is adjustably fixed to the tower and against gravitation by the means best shown in Figs. 3, 3ª and 7—that is to say, through the medium of cast iron blocks S riveted to its hooks N and having notches T, and locking pieces U detachably connected to the corner uprights *a* of the tower, and having lugs V which occupy the said notches T. From this it follows that each track may be fixed to the tower at various points in the height thereof, and in this connection I would have it understood that any suitable means may be employed to raise and lower either track P or R such, for instance, as a cable (not shown) connected to the track and passed through a pulley block (also not shown) fastened at or near the top of the tower. Each of the tracks P and R is equipped with a boom-carriage W, best shown in Fig. 4, having an eye *m*, and antifriction balls *n* for easing the movement of the carriage, and each boom-carriage is provided with end sockets to receive eye-bolts *p*, connected by chains *r* with eye-bolts *s* which, in turn, are connected to opposite sides of the tower, this with a view of retaining the boom-carriage at one end or the other of its respective track. It will be understood here that each track has end plates m^4 or other stops to limit movement of its boom-carriage and that the eye-bolts *p* are turned through openings in said end plates m^4 and into the threaded sockets in their respective carriage.

X is the plastic-material boom of the apparatus—*i. e.*, the boom which carries conduit L, and Y is the construction-boom—*i. e.*, the boom having to do with the placing of forms, reinforcing-metal work, etc. on the building that is being constructed; the boom X being connected with the eye *m* of carriage W in the track P, and the boom Y being connected with the eye *m* of the carriage W in the track R. The boom X is preferably shaped in cross-section as shown in Fig. 14 and is designed to extend downwardly from the tower at about the angle shown in Fig. 1. Fixed to the inner end of the boom X, preferably in the manner shown in Fig. 2, and extending at an acute angle to said boom X, is an arm Z to which are connected cables A^2 A^2 through which the boom is maintained in position and moved as occasion demands; the cable A^2 being carried over a sheave A^4, and thence down to any suitable power or manual means A^5 for taking up or paying out the cable A^2.

As will be readily appreciated, the described arrangement of the arm Z, relative to the boom X, is materially advantageous inasmuch as it affords considerable leverage in the maintainence of the boom X in the position shown and in the raising and lowering of said boom.

The conduit L which extends through the boom X, Fig. 14, may be and preferably is formed in sections detachably connected by wires in the manner shown at the top of Fig. 9 or in any other approved manner, and obviously said conduit may be of any desired length to extend to any point in the length of the boom or beyond the outer end of the boom. The outermost section l^5 of

the conduit L is made to depend from the boom and is connected in the swiveled manner shown in Figs. 1 and 11, with a pipe section L^3 which latter is designed to discharge into a pipe B^3 for conveying the plastic material to a form or the like; the said pipe B^3 being open for a portion of its length, as shown, so as to enable an attendant to readily clear it when necessary and in that way prevent choking of the conduit L.

When deemed expedient or desirable, the pipe section B^4 of Figs. 9 and 10 may be used in lieu of the pipe sections L^3 and B^3; the said section B^4 being connected in a swiveled manner to the outermost section l^3 of conduit L, and being of a greater size in cross-section for a portion of its length than the same, this latter in order to lessen the liability of the conduit L becoming choked.

The before described pan K is arranged on and connected by wires f^3 or other suitable means to the boom L in position to receive from the pipe G', and the reduced end of said pan K is suitably connected with and arranged to discharge into the conduit L, Fig. 7.

The construction boom Y is maintained in the position shown by a guy cable C^3 extending between its outer end and the tower A, and is toothed at its underside, as indicated by c^3. On said boom Y is arranged a traveler D^3 which carries a pulley block E^3 and a dog lever F^3, the latter having a comparatively heavy arm f^3 adapted to engage the teeth c^3 and also having its other arm connected to a cable G^3 which extends to the ground. It will be manifest from the foregoing that an attendant standing on the ground is enabled through the cable G^3 to move the traveler D^3 outwardly on the boom Y; also, that when the cable G^3 is relieved of pull the arm f^3 of lever F^3 will fall away from the teeth of the boom, this latter in order to permit of the traveler being drawn inwardly on the boom after a load has been raised through the medium of a cable H^3 which extends through the pulley block E^3 and another pulley block I^3 and is designed to be taken up and paid out by suitable power or hand means J^3.

It will be gathered from the foregoing that when the carriages of the booms X and Y are held at one corner of the tower the booms can be oscillated to encircle three-fourths of a building, and then by shifting the boom carriages to the other corner of the tower and there fastening the same, the booms may be moved to reach to the other one-fourth of the building. It will also be manifest that as a building is raised the booms and the appurtenances can be raised, and when the apparatus is in use the only manual labor necessary to the successful operation thereof is one man on the platform D, one man to manipulate the lines of the booms, and three men to supply and set materials and tamp walls, etc.

As before stated, the construction herein shown and described constitutes the best practical embodiment of my invention of which I am aware, but it is obvious that in the future practice of my invention various changes in the form, construction and relative arrangement of parts may be made within the scope of my invention as defined in the claims appended.

Having described my invention, what I claim and desire to secure by Letters-Patent, is:

1. An apparatus for the purpose described, comprising a tower, a suitably-supported horizontally movable boom connected therewith, a conduit carried by the boom, means for raising plastic material to a suitable point in the height of the tower, and means for receiving plastic material from said raising means and conducting the same to said conduit.

2. An apparatus for the purpose described, comprising a tower, a suitably-supported oscillatory boom connected therewith, a conduit carried by the boom, means for raising plastic material to a suitable point in the height of the tower, and means for receiving plastic material from said raising means and conducting the same to said conduit.

3. An apparatus for the purpose described comprising a tower, a boom connected at its inner end with the tower and having an arm fixed with respect to and extending upwardly and outwardly at an acute angle from its inner portion; said boom and its arm being movable together as one piece, and means connecting the outer portion of the arm and the portion of the tower above the boom.

4. An apparatus for the purpose described comprising a tower, a boom connected at its inner end with the tower and having an arm extending upwardly and outwardly at an acute angle from its inner portion, means connecting the outer portion of the arm and the portion of the tower above the boom, a conduit carried by the boom, means for raising plastic material to a suitable point in the height of the tower, and means for receiving plastic material from said raising means and conducting the same to said conduit.

5. An apparatus for the purpose described, comprising a tower, a conduit extending laterally therefrom, a suitably-supported, horizontally-movable boom carrying the conduit; said boom being adjustably connected with the tower and adapted to be arranged at various points in the height thereof, means for raising plastic material to the point desired in the height of the con-

duit, and means for receiving plastic material from the raising means and conducting same to the conduit; the said receiving and conducting means being adjustable in the direction of the height of the tower.

6. An apparatus for the purpose described, comprising a tower, a track thereon, a carriage movable on the track and across the tower, a suitably supported boom connected with said carriage, a conduit carried by said boom, means for raising plastic material to a desired point in the height of the tower, and means for receiving plastic material from the raising means and conducting said material to the conduit.

7. An apparatus for the purpose described, comprising a tower, a track connected with and extending across the tower, a carriage on the track, and a suitably supported boom connected and movable with the carriage.

8. An apparatus for the purpose described, comprising a tower, a track connected with and extending across the tower, a carriage on the track, a suitably supported boom connected and movable with the carriage, and means for detachably fastening the carriage at opposite ends of the track.

9. In an apparatus for the purpose described, the combination of a tower having upright bars of angular form in cross-section, a track resting in front of the bars and having angular hooks engaged with and movable vertically on the bars and also having means on the hooks adapted to cooperate with means on the tower for adjustably fixing the hooks in position, the said means on the tower, and a carriage on the track.

10. In an apparatus for the purpose described, the combination of a tower having upright bars of angular form in cross-section, a track resting in front of the bars and having angular hooks engaged with and movable vertically on the bars and also having notched blocks on the hooks, movable means on the tower adapted to coöperate with said blocks, and a carriage on the track.

11. In an apparatus for the purpose described, the combination of a tower, means for raising plastic material to a suitable height thereof, tracks arranged one above the other on the tower and adapted to be moved, a carriage movable on one track, a construction boom connected with said carriage, a carriage movable on the other track, a boom connected with the latter carriage, a conduit carried by said means, and means for receiving plastic material from the raising means and conducting the same to the conduit of the boom.

12. The combination of a boom toothed at its underside, a traveler arranged on the boom and depending therefrom, a lever dog carried by the depending portion of the traveler and having a comparatively heavy arm adapted to engage the teeth of the boom, and depending means connected with the other arm of the lever dog.

13. In an apparatus for the purpose set forth, the combination of a tower, a boom connected therewith, a conduit carried by the boom, means for raising plastic material to a suitable point in the height of the tower and above the inner end of the conduit, and means for receiving plastic material from said raising means and chuting the same to the conduit.

14. In an apparatus for the purpose set forth, the combination of a tower, a boom connected therewith, a conduit carried by the boom, means for raising plastic material to a suitable point in the height of the tower and above the inner end of the conduit, and means for receiving plastic material from said raising means and chuting the same to the conduit; said means comprising a pan and a movable support therefor.

15. In an apparatus for the purpose set forth, the combination of a tower, a boom connected therewith, a conduit carried by the boom, means for raising plastic material to a suitable point in the height of the tower and above the inner end of the conduit, and means for receiving plastic material from said raising means and chuting the same to the conduit; said means comprising a pan movably supported in the tower, a conduit connected therewith, and a pan on the boom and connected with the conduit carried thereby and arranged to receive material from the conduit on the first named pan.

16. An apparatus for the purpose described comprising a tower, a boom connected at its inner end with the tower and having an arm fixed with respect to and extending upwardly and downwardly at an acute angle from its inner portion; said boom and its arm being movable together as one piece, means connecting the outer portion of the arm and the portion of the tower above the boom, means on the tower for elevating plastic material to a point above the plane of the work to be performed, a hopper adapted to receive the material so elevated and mounted on the tower, and a distributing conduit carried by and revoluble with the boom and arranged beneath and adapted to receive material from the hopper.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

LEE CALLAHAN.

Witnesses:
W. I. WARNER,
W. E. BARTLETT.

more than one hundred miles from the place where the cause is to be tried, and with the consent of attending counsel.

I further certify that I am not of counsel or attorney to either of the parties, nor am I interested in the event of the cause.

I further certify that the fee for taking said depositions ($62) has been paid to me by defendants, and that the same is just and reasonable.

Witness my hand, and official seal at San Francisco, California, this third day of February, A. D. 1922.

Eugene P. Jones, Notary Public, Acting as Special Examiner Herein. (Seal.)

(Here follows Plaintiffs' Exhibit N, marked side folio pages 127-138, inclusive.)

[fol. 139] DEFENDANTS' EXHIBIT 36

United States of America,
Department of the Interior,
United States Patent Office.

To all to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the Records of this Office of Amendment to Preliminary Statement, forming part of Paper 10, filed September 1, 1909, in the matter of Interference Number 30,533, Smith v. Emtman v. Callahan, Subject-Matter: Material Transferring Accounts.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed in the District of Columbia this 19th day of January, in the year of our Lord one thousand nine hundred and twenty-one and of the Independence of the United States of America the one hundred and forty-fifth.

L. B. Mann, Acting Commissioner of Patents. (Seal.)

[fol. 140] IN THE UNITED STATES PATENT OFFICE

Before the Examiner of Interferences

St. Louis, August 30, 1909.

In re Interference No. 30,533 A

CALLAHAN

v.

EMTMAN

v.

SMITH

AMENDMENT TO PRELIMINARY STATEMENT

Now, this day, before the taking of testimony and immediately upon the receipt of the requirement of the Examiner of Interferences, dated August 27, 1909, comes Arthur L. Smith, a party hereto, and amends his preliminary statement by interlineation as follows:

Page 2, line 6, after the words "that the same was completed" insert the words "during the month of September, 1906,".

Page 2, line 7, after the words "successful operation" insert "during the month of September, 1906,".

Arthur L. Smith, by Hopkins & Eicks, His Attorneys.

STATE OF MISSOURI,
City of St. Louis, ss:

James L. Hopkins, of lawful age, being on his oath sworn, deposes and says that the facts contained in the foregoing amendment are true; that he is a member of the firm of Hopkins & Eicks, attorneys for Arthur L. Smith herein; that the above and foregoing amendment to the preliminary statement of Arthur L. Smith has been prepared by him from information given to him by said Arthur L. [fol. 141] Smith, which information was imparted to affiant by said Smith prior to the departure of said Smith from the United States.

That the said Arthur L. Smith is an engineer in the employ of the War Department of the United States; that in pursuance of his duty he left the United States after signing his preliminary statement, on or before the 5th day of August, 1909, for Corregidor Island, Philippine Islands.

That affiant makes this affidavit and the foregoing amendment on account of the absence of his client from the United States and the impossibility of securing the affidavit of the said Arthur L. Smith in the regular course of the mails in time to comply with the order allowing said Arthur L. Smith until September 13th, 1909, to file an amendment to the statement herein.

And Affiant further states that upon inquiry of the Postal authorities of the United States in the City of St. Louis, Missouri, he is advised that the average course of the mails between St. Louis, Missouri, and Corregidor Island, Philippines, is one month; dependent, of course, upon the sailing dates of steamers carrying mails from the Pacific Coast ports.

And further affiant saith not.

James L. Hopkins.

Subscribed and sworn to before me this 30th day of August, 1909. Walter C. Stein, Notary Public. My commission expires November 22, 1910. (Seal.)

[fol. 142] 30533-2

IN THE UNITED STATES PATENT OFFICE

Interference No. 30533 A

ARTHUR L. SMITH

v.

THEODORE EMTMAN

v.

LEE CALLAHAN

Subject-matter: Devices for Distributing Concrete

Statement of Smith filed July 30, 1919; examined Aug. 27, 1909; Approved —— —, 190-.

PRELIMINARY STATEMENT OF ARTHUR L. SMITH

CITY OF ST. LOUIS,
State of Missouri, ss:

Arthur L. Smith, of the City of Washington in the District of Columbia, late of the City of St. Louis, State of Missouri, being upon his oath duly sworn, deposes and says:

That he is the same Arthur L. Smith who is named as a party to the above-entitled interference, in which his application for patent for Improvements in Devices for Distributing Concrete, Serial No. 479,479, filed February 23, 1909, has been adjudged to be in interference with the applications for patents of Theodore Emtman and Lee Callahan.

That he conceived the invention set forth in the declaration of interference in the month of July, 1906; that afterwards, and in the month of July, 1906, he made several sketches of a device for the

practice of his said invention, and has subsequently made other sketches thereof and explained them to others; that he first made drawings of the invention at issue in or about the month of July of the year 1906; that, aside from the actual reduction to practice of his invention, as hereinafter set forth, he has never made a model thereof; that in or about the month of July, 1906, he first disclosed [fols. 143 & 144] and explained the invention to others; that he reduced his said invention to practice by the actual erection and construction of a machine embodying his invention at the City of Norfolk, Norfolk County, Virginia, beginning the construction thereof in the month of August, 1906, and that the same was completed and put into successful operation at said place and continued for about two months in use and operation in and about the erection of the Lynnhaven Hotel at the corner of Granby and Freemason Streets in the said City of Norfolk; that the said invention has been used in the construction of the Lynnhaven Hotel at Norfolk, Virginia, as last above set forth, and was subsequently used in the month of June, 1907, in the said City of Norfolk, Virginia, in the construction of the Vinery Building in said City of Norfolk, comprising stores and apartments, and subsequently during the year 1908, the said invention was employed by this affiant in the erection of the St. Louis Coliseum in the City of St. Louis, Missouri; that said invention was used throughout the entire construction of the walls of each of the edifices referred to, and that the building contracts in the course of which the said invention was so used amounted to an aggregate of about $560,000; the contract for the Vinery Building being in the sum of $60,000; that of the Lynnhaven Hotel being in the sum of $200,000, and that of the St. Louis Colliseum being in the sum of $300,000.

And further affiant saith not.

Arthur L. Smith.

Subscribed and sworn to before me this 28th day of July, 1909. Walter C. Stein, Notary Public. My commission expires November 22, 1910. (Seal.)

(Here follow Defendants' Exhibits 38 and 39, marked side folio pages 145-148, inclusive.)

[fol. 149] DEFENDANTS' EXHIBIT 63

United States of America,
Department of the Interior,
United States Patent Office.

To all to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the Records of this Office of the Preliminary Statement of Arthur L. Smith, filed July 30, 1919, in the matter of Interference Number 30,533, Smith v. Emtman v. Callahan, Subject Matter: Devices for distributing concrete.

BLUEPRINT
TOO
LARGE
FOR
FILMING



In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at Washington in the District of Columbia, this 7th day of August, in the year of our Lord one thousand nine hundred and twenty and of the Independence of the United States of America the one hundred and forty-fifth.

M. H. Coulston, Acting Commissioner of Patents. (Seal.)

[fol. 150] IN THE UNITED STATES PATENT OFFICE

Interference No. 30533 A

ARTHUR L. SMITH

v.

THEODORE EMTMAN

v.

LEE CALLAHAN

Subject-matter: Devices for Distributing Concrete

Statement of Smith filed July 30, 1909; Examined Aug. 27, 1909; approved —— —, 190-.

PRELIMINARY STATEMENT OF ARTHUR L. SMITH

CITY OF ST. LOUIS,
State of Missouri, ss:

Arthur L. Smith, of the City of Washington in the District of Columbia, late of the City of St. Louis, State of Missouri, being upon his oath duly sworn, deposes and says:

That he is the same Arthur L. Smith who is named as a party to the above-entitled interference, in which his application for patent for Improvements in Devices for Distributing Concrete, Serial No. 479,479, filed February 23, 1909, has been adjudged to be in interference with the applications for patents of Theodore Emtman and Lee Callahan.

That he conceived the invention set forth in the declaration of interference in the month of July, 1906; that afterwards, and in the month of July, 1906, he made several sketches of a device for the practice of his said invention, and has subsequently made other sketches thereof and explained them to others; that he first made drawings of the invention at issue in or about the month of July of the year 1906; that, aside from the actual reduction to practice of his invention, as hereinafter set forth, he has never made a model thereof; that in or about the month of July, 1906, he first disclosed and explained the invention to others; that he reduced his said in-
[fol. 151] vention to practice by the actual erection and construction of a machine embodying his invention at the City of Norfolk, Norfolk County, Virginia, beginning the construction thereof in

the month of August, 1906, and that the same was completed and put into successful operation at said place and continued for about two months in use and operation in and about the erection of the Lynnhaven Hotel at the corner of Granby and Freemason Streets in the said City of Norfolk; that the said invention has been used in the construction of the Lynnhaven Hotel at Norfolk, Virginia, as last above set forth, and was subsequently used in the month of June, 1907, in the said City of Norfolk, Virginia, in the construction of the Vinery Building in said City of Norfolk, comprising stores and apartments, and subsequently during the year 1908, the said invention was employed by this affiant in the erection of the St. Louis Coliseum in the City of St. Louis, Missouri; that said invention was used throughout the entire construction of the walls of each of the edifices referred to, and that the building contracts in the the course of which the said invention was so used amounted to an aggregate of about $560,000; the contract for the Vinery Building being in the sum of $60,000; that of the Lynnhaven Hotel being in the sum of $200,000, and that of the St. Louis Coliseum being in the sum of $300,000.

And further affiant saith not.

Arthur L. Smith.

Subscribed and sworn to before me this 28th day of July, 1909. Walter C. Stein, Notary Public. My commission expires November 22, 1910. (Seal.)

[fol. 152] UNITED STATES OF AMERICA

Department of the Interior,
United States Patent Office.

To all to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the Records of this office of the Preliminary Statement of Lee Callahan, filed August 13, 1909, in the matter of Interference Number 30,533, Smith vs. Emtman vs. Callahan. Subject-matter: Material Transferring Apparatus.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at Washington in the District of Columbia, this 7th day of August, in the year of our Lord one thousand nine hundred and twenty and of the Independence of the United States of America the one hundred and forty-fifth.

M. H. Coulston, Acting Commissioner of Patents. (Seal.)

[fol. 153] IN THE UNITED STATES PATENT OFFICE

Interference No. 30,533 A

LEE CALLAHAN

vs.

THEODORE EMTMAN

vs.

ARTHUR L. SMITH

Statement of Callahan filed August 13, 1909; examined August 27, 1909; approved —— —, 190-.

PRELIMINARY STATEMENT OF LEE CALLAHAN

Lee Callahan, of San Diego, in the County of San Diego, and State of California, being duly sworn, doth depose and say that he is a party to the interference declared by the Commissioner of Patents July 13, 1909 between his application for Letters-Patent, filed January 21, 1909, serial number 473,461, and the application of Theodore Emtman, and also the application of Arthur L. Smith, for a patent on Material Transferring Apparatus; that he conceived the invention set forth in the declaration of interference on or about the 15th of July, 1907; that from time to time, beginning with the conception of the invention, he made sketches and drawings, and made a full size working drawing on or about November 5, 1908; that he first explained the invention to others on or about August 15, 1907; that he made a model of the invention on or about July 15, 1907, and that he made various other models between July 15th and 18th, 1907; that he made a full and complete apparatus beginning with the 18th of September, 1908 and completed the same on the 11th of October, 1908; that inasmuch as the apparatus was then complete and successfully operated he considers that he reduced his invention to actual practice not later than October 11, 1908; that [fol. 154] the invention has been successfully used in the erection of structures in various places, and particularly at Colton, California, San Bernardino, California, Pasadena, California, San Jose, California, and Los Angeles, California, and that the invention is being successfully used at present.

Lee Callahan.

Subscribed to and sworn before me this 9th day of August, 1909. C. T. Hirst, Notary Public. My commission expires May 21, 1910. (Seal.)

30533—6

IN THE UNITED STATES PATENT OFFICE

Interference 30533

THEODORE EMTMAN

v.

ARTHUR L. SMITH

v.

LEE CALLAHAN

Subject-matter Concrete Construction

Statement of Emtman filed August 16, 1909; Examined August 27, 1909; Approved —— —, 190-.

PRELIMINARY STATEMENT OF THEODORE EMTMAN

STATE OF CALIFORNIA,
County of Los Angeles, ss:

Theodore Emtman, of Los Angeles, County of Los Angeles, State of California, being duly sworn, deposes and says: That he is a party [fol. 155] to the Interference No. 30533 declared by the Commissioner of Patents July 13, 1909, and between said Emtman's application for Letters Patent filed February 17th, 1909, serial No. 478520, and an application of Arthur L. Smith, of St. Louis, Missouri, and an application of Lee Callahan, of San Diego, California; that deponent conceived the invention set forth in the said declaration of interference during the month of June, 1906; that he made a sketch of the invention during the month of October, 1906; that he first explained the invention to others during the month of December, 1906, and again in October, 1907; that he commenced the construction of his invention in a full sized apparatus during the month of November, 1907, and completed it in about the latter part of December, 1907; and that the said apparatus was first successfully operated during the latter part of December, 1907; or early part of January 1908, in Los Angeles, California; that he has since continued to use the same and that since then he has manufactured seven other similar apparatus, and that no application for patent on the said invention has been made in any country foreign to the United States.

Theodore Emtman.

Subscribed and sworn to before me this 31st day of July, 1909. James Gysin, Notary Public in and for Los Angeles County, State of California.

[fol. 156] 30,618—4

IN THE UNITED STATES PATENT OFFICE

Interference 30,618

THEODORE EMTMAN

vs.

LEE CALLAHAN

Subject-matter: Concrete Construction

Statement of Emtman filed August 16, 1909; Examined August 27, 1909; Approved —— —, 190-.

PRELIMINARY STATEMENT OF THEODORE EMTMAN

STATE OF CALIFORNIA,
County of Los Angeles, ss:

Theodore Emtman, of Los Angeles, County of Los Angeles, State of California, being duly sworn, deposes and says; that he is a party to the interference No. 30618, declared by the Commissioner of Patents July 13, 1909; and between said Emtman's application for letters patent filed February 17th, 1909, serial number 478520, and an application of Lee Callahan, of San Diego, California; that deponent conceived the invention set forth in the said declaration of interference during the month of June, 1906; that he made a sketch of the invention during the month of October, 1906; that he first explained the invention to others during the month of December, 1906, and again in October, 1907; that he commenced the construction of his invention in a full sized apparatus during the month of November, 1907, and completed it in about the latter part of December, 1907; and that the said apparatus was first successfully operated during the latter part of December, 1907; or early part of January, 1908, in Los Angeles, California; that he has since con-
[fol. 157] tinued to use the same and that since then he has manufactured seven other similar apparatus, and that no application for patent on the said invention has been made in any country foreign to the United States.

Theodore Emtman.

Subscribed and sworn to before me this 31st day of July, 1909. James Gysin, Notary Public in and for Los Angeles County, State of California.

United States of America,
Department of the Interior,
United States Patent Office.

To all to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the Records of this Office of the Preliminary Statement of Lee Callahan, filed August 13, 1919, in the matter of Interference Number 30,618, Emtman vs. Callahan, Subject-matter: Material Transferring Apparatus.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at Washington in the District of Columbia, this 17th day of August in the year of our Lord one thousand nine hundred and twenty and of the Independence of the United States of America the one hundred and forty-fifth.

M. H. Coulston, Acting Commissioner of Patents. (Seal.)

[fol. 158] 30618—2

IN THE UNITED STATES PATENT OFFICE

Interference No. 30,618 A

LEE CALLAHAN

vs.

THEODORE EMTMAN

Statement of Callahan filed August 13, 1919; examined August 27, 1909; Approved —— —, 190-.

PRELIMINARY STATEMENT OF LEE CALLAHAN

Lee Callahan of San Diego, in the County of San Diego, and State of California, being duly sworn, doth depose and say that he is a party to the interference declared by the Commissioner of Patents July 13, 1909, between his application for Letters-Patent, filed January 21, 1909, serial No. 473,461, and the application of Theodore Emtman, for a patent on Material Transferring Apparatus; that he conceived the invention set forth in the declaration of interference on or about the 15th of July, 1907; that from time to time beginning with the conception of the invention he made sketches and drawings and made a full size working drawing on or about November 5, 1908; that he first explained the invention to others on or about August 15, 1908; that he made a model of the invention on or about July 15th, 1907, and that he made various other models between July 15th, and 18th, 1907; that he made a full and complete apparatus beginning with the 18th of September, 1908 and completing the same on the 11th of October, 1908; that inasmuch as

DEFENDANTS' EXHIBIT 67.

SMITH PATENT 948,746.

162-163

A. L. SMITH.

DEVICE FOR DISTRIBUTING CONCRETE.

APPLICATION FILED FEB. 23, 1909.

948,746.

Patented Feb. 8, 1910.

3 SHEETS—SHEET 1.

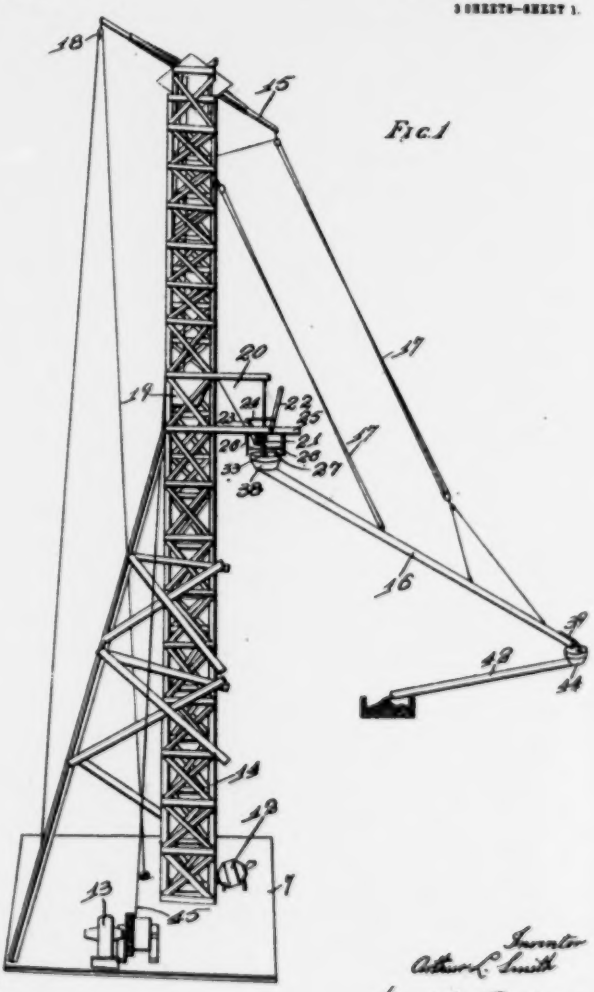


Fig. 1

Witnesses
H. B. Stevens
E. C. Goldthwaite

Inventor
Arthur L. Smith
by Hopkins & Eaton Attys

164–165

A. L. SMITH.

DEVICE FOR DISTRIBUTING CONCRETE.

APPLICATION FILED FEB. 23, 1909.

948,746.

Patented Feb. 8, 1910.

2 SHEETS—SHEET 2.

Fig. 2

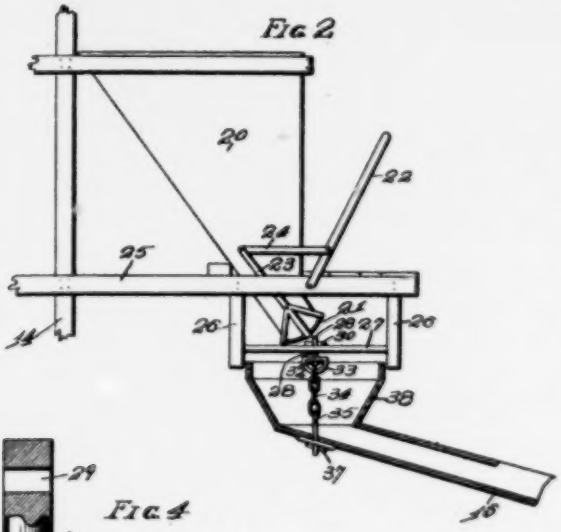


Fig. 4

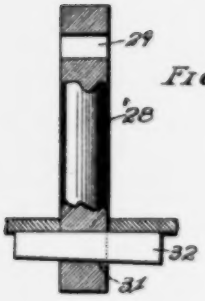
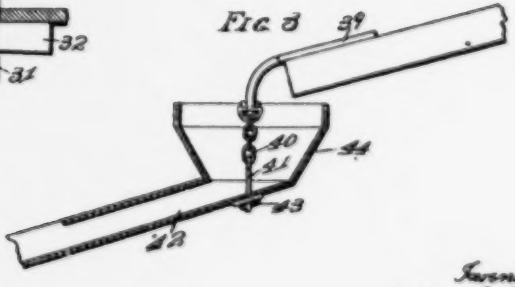


Fig. 3



Witnesses
W. B. Stiles
L. A. Coffin Jr.

Inventor
Arthur L. Smith
by Robertson & Eccles attys

166

A. L. SMITH.

DEVICE FOR DISTRIBUTING CONCRETE.

APPLICATION FILED FEB. 23, 1909.

948,746.

Patented Feb. 8, 1910.

3 SHEETS—SHEET 3.

Fig. 5

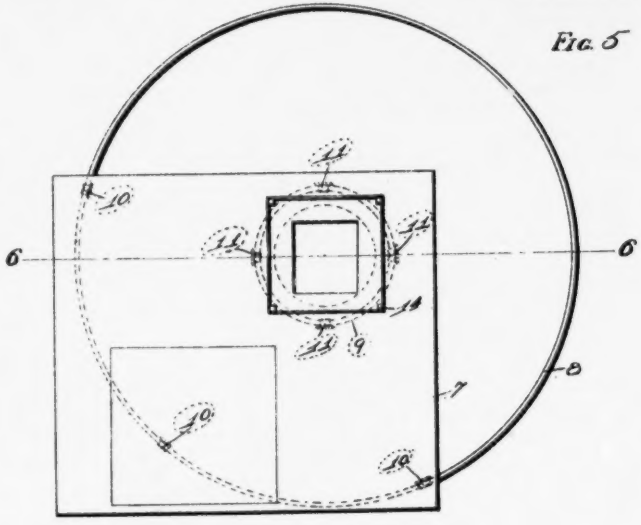
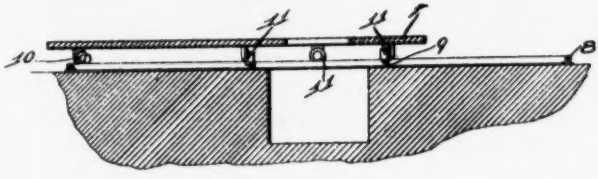


Fig. 6



Witnesses
H. B. Stein
L. A. McIntyre

Inventor
Arthur L. Smith
by Hopkins & Ericks Attys

UNITED STATES PATENT OFFICE.

ARTHUR L. SMITH, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CONCRETE APPLIANCES COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

DEVICE FOR DISTRIBUTING CONCRETE.

948,746. Specification of Letters Patent. Patented Feb. 8, 1910.

Application filed February 23, 1909. Serial No. 479,479.

To all whom it may concern:

Be it known that I, ARTHUR L. SMITH, a citizen of the United States, and resident of St. Louis, Missouri, have invented certain new and useful Improvements in Devices for Distributing Concrete, of which the following is a specification.

My invention relates to an improved device for distributing concrete, and has for its object to provide means whereby concrete, during the process of concrete building construction, is distributed from a single source to many different points of deposit.

In the drawings—Figure 1 is a perspective view of a device embodying my invention. Fig. 2 is an enlarged side plan view of the distributing hopper employed in my invention and its connections. Fig. 3 is a side plan view of the lower end of the first distributing pipe employed in my invention, showing its mode of adjustment to the second distributing pipe. Fig. 4 is an enlarged plan view of the pin employed as a fastener in suspending the upper end of the first distributing pipe; showing the upper and lower ends of said pin in section. Fig. 5 is a top plan view of the turntable and track employed in my invention. Fig. 6 is a transverse vertical view in section of the same taken along the line 6—6 of Fig. 5.

As illustrated in the drawings, the device of my invention employs a platform 7 rotatably mounted upon the track 8 and inner concentric track 9 by means of the wheels 10 and 11. Upon the platform 7 the concrete mixer 12 and the motor 13 are mounted; the platform 7 carrying the derrick 14. The derrick 14 is provided with the boom 15 at its top, said derrick and boom serving to suspend the first distributing pipe 16 by means of suitable block-and-tackle connections indicated in the drawings by the numeral 17; the position of the boom 15 being controlled by the block 18 and its connections.

The concrete mixed in the mixer 12 is conveyed in a bucket 19 elevated by means of the rope 45 to the point where the hopper 20 is mounted upon the derrick 14. The bottom of the hopper is provided with the closure 21 operated by the lever 22 through the connecting members 23 and 24; the lever 22 being pivotally mounted on the beam 25. From the beam 25 the suspending members 26—26 extend to a point beneath the mouth of the hopper 20 and carry the cross bar 27 which is perforated to admit the upper end of the pin 28. The pin 28 is provided with the slot 29 which is adapted to receive the key 30; the object of this construction being to avoid the use of a bolt and nut, the action of the concrete in time rendering it impossible to remove the nut from the bolt. The lower end of the pin 28 is provided with a slot 31 to receive the key 32 by means of which the yoke 33 is retained in position. The chain 34 serves to hold the pin 35 which passes through the lower wall of the distributing pipe 16 and is secured in place by means of the key 37 passing through the slot in its lower end. The pipe 16 is provided with a hopper 38 at its upper end, and at its lower end is provided with the arm 39 supporting a chain 40, by which the pin 41 is supported, the pin 41 passing through the bottom of the second distributing pipe 42 and being secured in place by a key 43. The pipe 42 is provided at its upper end with the hopper 44. It will thus be seen that the lower distributing pipe 42 is so suspended with reference to the mouth of the upper distributing pipe 16 that it can be revolved throughout a radius of 360°; while the upper distributing pipe 16 may be similarly revolved with reference to the bottom of the hopper 20.

In the use of my invention, the tracks 8 and 9 are laid as nearly as practicable at the center of the building to be erected. The concrete is then mixed, elevated and distributed through the pipes 16 and 42 to the various forms or molds to be filled; the hopper 20 being carried by the derrick 14 at a point above the plane of the highest point to which concrete is to be distributed. The rate of flow of the concrete from the hopper 20 to the point of distribution is governed by the consistency of the concrete and the angles at which the pipes 16 and 42 are respectively mounted.

When desired, a third or any desired number of additional distribution pipes may be added, the first of the pipes so added being suspended from the mouth of the pipe 42 and the others added to connect therewith in their order. But I have found in practice that the structure shown with but two distributing pipes is operative on a scale sufficiently large for the construction of buildings of any usual size.

Having fully described my invention, what I claim as new and desire to have secured to me by the grant of Letters Patent, is:

1. In a device for distributing concrete, means for elevating the concrete to a point above the plane of the work to be performed; a hopper adapted to receive the concrete so elevated; a primary distributing pipe revolubly mounted beneath the hopper; and a secondary distributing pipe revolubly mounted beneath the mouth of the first-named distributing pipe, substantially as described.

2. In a device for distributing concrete, means for elevating the concrete to a point above the plane of the work to be performed; a hopper adapted to receive the concrete so elevated; a primary distributing pipe revolubly mounted beneath the hopper; a secondary distributing pipe revolubly mounted beneath the mouth of the first-named distributing pipe, and means for controlling the flow of concrete from the hopper to the first-named distributing pipe, substantially as described.

3. In a device for distributing concrete, a concrete elevator; a revolubly mounted distributing pipe adapted to be fed by said elevator; a second distributing pipe revolubly mounted at the mouth of the first-named distributing pipe, and means for controlling the angle at which said distributing pipes are mounted, substantially as described.

4. A plant for concrete construction comprising an elevator provided with means for receiving and raising concrete, a chute adapted to receive the concrete raised by the elevator and to deliver the same by gravity, said chute being inclined and being movable horizontally to shift the point of delivery of the concrete, the lower end of said chute being provided with a horizontally rotatable delivery pipe.

In testimony whereof, I have signed my name to this specification, in presence of two subscribing witnesses.

ARTHUR L. SMITH.

Witnesses:
WALTER C. STEIN,
L. A. L. MCINTYRE.

DEFENDANTS' EXHIBIT 68.

CERTIFIED COPY OF SKELETON HISTORY OF EMTMAN PATENT 948,723.

UNITED STATES OF AMERICA.

DEPARTMENT OF THE INTERIOR.

UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the Records of this Office of the Original Claims, Papers 2 and 5, and the Face of the File Wrapper in the matter of the

Letters Patent of

Theodore Emtman, Assignor, by mesne assignments, to

Concrete Appliances Company,

Number 948,723, Granted February 8, 1910,

for

Improvement in Plants for Concrete Construction.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed in the District of Columbia this 26th day of October, in the year of our Lord one thousand nine hundred and twenty-one and of the Independence of the United States of America the one hundred and forty-sixth.

260

Acting Commissioner of Patents.

170

DIV. 4 (EXT'S BOOK) 203 308

1999

NUMBER (Series of 1900), 478520 PATENT No. 948723

Name Theodore Emtsman,
Assignor to L. O. Engstrom Company of
Los Angeles, Cal. a citizen of Cal.
[illegible] assignor to James A. Hopkins,
of St. Louis, Mo. and Francis A. Lyon, of Los
Angeles, California, [illegible]
of Los Angeles
County of Concrete Appliance Company, of St. Louis, Mo. a corp. of Mo.
State of California
Invention Plant for Concrete Construction

PARTS OF APPLICATION FILED.

	ORIGINAL	RENEWED
Petition	Feb 17, 1909	, 190
Affidavit	" 17, 1909	, 190
Specification	" 17, 1909	, 190
Drawing	" " , 1909	, 190
Model or Specimen	, 190	, 190
First Fee Cash	, 190	, 190
" " Cert $15	Feb 17, 1909	, 190
Appl. filed complete	" " , 190 "	, 190

Division of App., No. , Filed , 190

Examined B.W. Red E. Dec 17. 1909
Countersigned For Commissioner
Notice of Allowance Dec 24, 1909 For Commissioner
Final Fee Cash $20 - Jan 12, 1910
" " Cert , 190
Patented February 8, 1910
Associate Attorney Attorneys Glossbrenner, Lyon & Hackley,
Merchants Trust Bldg.
Los Angeles, Cal.

Name Emtsman T. Serial No. 478.520.
Patent No. Date of Patent

What I claim is:--

Cancelled per. B

1. A plant for concrete construction comprising an elevator provided with means for receiving and raising concrete, a chute adapted to receive the concrete raised by the elevator and to deliver the same by gravity, said chute being inclined and being movable horizontally to shift the point of delivery of the concrete.

2. A plant for concrete construction comprising an elevator provided with means for receiving and raising concrete, a chute adapted to receive the concrete raised by the elevator and to deliver the same by gravity, said chute being inclined and being movable vertically to shift the point of delivery of the concrete.

3. A plant for concrete construction comprising an elevator provided with means for receiving and raising concrete, a chute adapted to receive the concrete raised by the elevator and to deliver the same by gravity, said chute being inclined and being movable horizontally and vertically to shift the point of delivery of the concrete.

Cancelled per C

4. A plant for concrete construction comprising an elevator provided with means for receiving and raising concrete, a chute adapted to receive the concrete raised by the elevator and to deliver the same by gravity, said chute being inclined and being movable horizontally to shift the point of delivery of the concrete, the lower end of said chute being provided with a horizontally rotatable delivery pipe.

5. A plant for concrete construction comprising an elevator provided with means for receiving and raising concrete, a chute adapted to receive the concrete raised by the elevator and to deliver the same by gravity, said chute being mounted to rotate on a vertical axis.

6. A plant for concrete construction comprising an elevator provided with means for receiving and raising concrete, a chute adapted to receive the concrete raised by the elevator and to deliver the same by gravity, a mast mounted to rotate on a vertical axis, a chute pivoted to said mast and extending therefrom at an inclination to feed the concrete by gravity, and a boom supporting said chute and having extensible connections with the mast to vary its vertical position.

7. A plant for concrete construction comprising an elevator provided with means for receiving and raising concrete, a chute adapted to receive the concrete raised by the elevator and to deliver the same by gravity, a mast mounted to rotate on a vertical axis, a chute pivoted to said mast and extending therefrom at an inclination to feed the concrete by gravity, a boom supporting said chute and having extensible connections with the mast to vary its vertical position, and a delivery pipe swivelled to the lower end of said chute to turn it to different angular positions.

APK-F.

Cancelled Fer. B.

8. A plant for concrete construction comprising in combination with means for preparing, including mixing the various materials which are to form the concrete, an elevator provided with means for receiving and raising the concrete as prepared by said first means, a chute adapted to receive the concrete raised by said elevator and to deliver the same by gravity, said chute being inclined and being movable horizontally to shift the point of delivery of the concrete.

Amount of ↑

1.7.1.D. Chute Agreeable Leg L. & U. Trunks.

Div. 4 Room 232 MEP-Ba Paper No. 2

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., May 8, 1909

Theodore Emtman,

c/o Townsend, Lyon and Hackley,

Los Angeles, Cal,

Please find below a communication from the EXAMINER in charge of your application.

Serial No. 478,520, filed February 17. 1909, for Plant for Concrete Construction.

E. B. Moore.

Commissioner of Patents.

Case examined.

The "bearing 21'" line 25, page 3, is not designated on the drawing.

Claims 1, 2, 3 and 5 are met by Dinsmore, 438,612, Oct. 21, 1890 (V.H. & D) considered jointly with Record, 667,335, Feb. 5, 1901 (Chutes) or Walsh, 560,382, May 19, 1896 (ib).

No invention is required to substitute a chute such as is shown by Record and Walsh, for the form of chute shown in Dinsmore.

Claim 4 is met by Dinsmore and Record, cited, in view of Gilson, 360,290, Mar. 29, 1887 (Spouts).

Where are the "extensible connections" referred to in claims 6 and 7?

All that claim 8 contains that is beyond a mere aggregation of devices is shown in the Record and Dinsmore patents.

Claims 1, 2, 3, 4, 5 and 8 are rejected on references above noted, while claims 6 and 7 are not clearly shown.

B.

B. W. Pond
200 &

175-176

Div. 4. Room. 232 MKP-Ba Paper No. 5

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

WASHINGTON, D. June 14, 1909

Theodore Emtman,

c/o Townsend, Lyon and Hackley,

Los Angeles, Cal.

Please find below a communication from the ***EXAMINER*** *in charge of your application,*

Serial No. 478,520, filed February 17, 1909, for Plant for Concrete Construction.

E. B. Moore.

Commissioner of Patents.

Amended June 1, 1909:

An interference has been formulated between this application and two other pending applications filed by Smith and Callahan and a declaration of a second interference involving only the applications of Emtman and Callahan will be made as soon as some objections to both cases are removed by amendment. To that end, attention is again called to Office action of May 8, in this case, in which claims 1, 2, 3, 5 and 8 were rejected, and claims 6 and 7 were objected to. The claims named are again refused, and proper response should be made at once to this action.

B.

BWR

the apparatus was then complete and successfully operated he considers that he reduced the invention to actual practice not later than October 11, 1908; that the invention has been successfully used in [fol. 159 & 160] the erection of structures in various places, and particularly at Colton, California, San Bernardino, California, Passadena, California, San Jose, California, Los Angeles, California, and that the invention is being successfully used at present.

Lee Callahan.

Subscribed and sworn to before me this 9th day of August, 1909. C. T. Hirst, Notary Public. My comiss. expires May 21, 1920. (Seal.)

(Here follow Defendants' Exhibits 67 and 68, marked side folio pages 161-176, inclusive.)

[fol. 177] IN UNITED STATES DISTRICT COURT

OPINION SUR TRIAL HEARING ON BILL—Filed June 13, 1922

DICKINSON, J.:

This cause concerns Letters Patent 948,719, applied for January 21, 1909, and issued February 8, 1910, to Lee Callahan, for an apparatus for hoisting and distributing concrete.

One defence is the absence of invention. Whenever the patented thing is a construction the question often arises of whether it is the product of invention or merely of constructive skill. How near this border line the subject matter of this patent is its juridical experience shows. One Court before which the patent has been was not able to find invention; the other found it.

The patented thing with which we are now concerned is an appliance for use as an aid in large building operations. Given the thought of its use and the plan of its construction, all else may be done by the user. It is used in the building trade in operations of which concrete construction is a part. The cement must be brought to the place of the concrete construction in a condition in which it will "set." The first thought in the appliance is that of the utilization of the force of gravity. The cement is conveniently "mixed" on the ground. The concrete work may be placed far above it. When "mixed" must be lifted to a height. This varies. It must thence flow to the required place. This shifts. These needs suggest the features which such an appliance must possess. They may be listed by paraphrasing the language of Claim 5 (the most significant one in issue), enumerating its elements, although in a somewhat different order of statement and with additions. They are, [fol. 178] together with appropriate support fastenings, (1) a mast or tower to provide for a hoist; (2) a bucket, scuttle or skip in which to carry up the cement; (3) hoists to raise and lower the bucket;

(4) a hopper in which to deposit it for distribution; (5) a pipe, trough or other conduit to conduct its flow; (6) provision for the hopper and the high end of the conduit being maintained at adjustable heights; (7) provision for a swiveled or goose-necked attachment of the conduit to the tower so that the conduit would have freedom of movement of its discharging end both vertically and laterally; and (8) possibly a "boom" or other support for the conduit in addition to its attachment to the tower. Whether all these needs are obvious, and providing for them, calls only for ordinary constructive skill, determines the question of invention. As every element named had long been used in kindred arts and every one of them separately or in smaller groups in this art, it is manifest that invention could reside only in the novel thought of their use in combination. It is also evident that these needs and practicable provision to meet them would vary with the conditions under which the work was to be done as the means of depositing the cement must be adapted to these conditions. The owner of any appliance for doing what was thus required to be done might sell it to the user, having had it fabricated in parts, and assemble and erect it at the place of the operation, or he might license those in charge of the operation to make and erect it, thereby selling to them the naked thought of its use, together with plans for its construction and erection. Indeed, the latter was what the owner of this patent at first did, disguising the sale of the use of the mere idea by providing a superintendent of construction.

Early in the more general use of concrete construction what is called "dry cement" was favored. There was a pronounced prejudice [fol. 179] against the use of the more liquid form now accepted. It took time to overcome this prejudice. The introduction of "reinforced concrete," and the greater facility in handling cement when "wet" probably caused the preference for "dry" to be yielded and the prejudice against the "wet" to be abated. The increase in the volume of the cement used also of course contributed. This prejudice still lingers, and as long as it was general, the "gravity" method of distribution was little used. When the "wet" concrete came into general use and the operation was a large one, the "gravity" method was feasible and practically necessary. Some of the appliances were the veriest makeshifts. "Chutes" were in common use. They must of course be supported. Halyards; "horses;" "trestles;" "falsework;" "cross yards;" and all kinds of supports, including, as is claimed, even "booms," were used. The methods of handling the cement adopted, and the means employed, were suggested, if not dictated, by the conditions with which the builder was forced to cope. In such a state of the art to give a monopoly of any one method is fraught with danger of injustice. A builder might be obstructed in his choice of methods which were open to all, or he might find himself shut out from the use of one which had been in use. Indeed this is the very situation which is the basis of the defence now made. The defendants and other builders in sympathy with them resent as an injustice that they are charged for the use of a method of doing

concrete work which would be adopted by any one who had the work to do without any hint gathered from this patent. The practical importance to them and through them to the owners of buildings is attested by the fact that when the plaintiff charged merely for the use of the ideas behind his appliance the license fee de- [fol. 180] manded was on the basis of the concrete laid and was ten cents a yard. The charge now made for the constructed appliance is thirty-five hundred dollars ($3,500). If what is thus charged for is what any competent builder would do without the aid of any suggestions from the patentee the sum demanded is a tax. If on the other hand, however, the plaintiff's appliance is the product of patentable invention, the right to use it is the property of the patentee.

This brings us to face the question of invention. Right here the defendant is confronted with the ruling by the Circuit Court of Appeals for the Sixth Circuit, the supplementary opinion supporting which is reported in 262 Fed. Rep., 958.

How far is the question still an open one for a trial Court to determine? The res adjudicata doctrine of course does not apply because the present defendant was in no sense a party to that cause. At least some, however, of the very questions which now arise were determined in that case with all before that Court which is before us. One was the question of invention, and the other of novelty as affected by prior patents and previous publications only. There is, or at least there is claimed to be, evidence of the state of the prior art and of anticipation by prior use which was not then before the Court. A patent right is a property right in respect to which the validity of the grant is analagous to a good title to other property. The thought of a right in any one to property to which he has not a good title cannot be entertained. There is a contradiction in terms. So likewise there is no property right in any real sense in a patent which is of validity in one district or circuit and not in others. Letters patent give only the right to assert a property right and are barely, if anything, more than prima facie evidence of it. The mere grant of [fol. 181] letter can, for obvious reasons, be given no greater effect than this. An adjudication of validity in one case by a trial Court is binding upon another in a suit upon the same patent only so far as the rulings made are of persuasive force. This limitation of its effect is likewise necessary. There must, however, come a time when an adjudication of validity must be recognized as binding not only upon parties and privies but in all other suits. This does not mean an absolutely conclusive finding because every new litigant must be accorded his day in Court, but it does mean that the finding of validity will not be disturbed merely because the Court before which the later case is heard differs in opinion from the Courts which made the earlier adjudications. There must be, in the later case, something which would not merely justify and support a different ruling but something which compels it. The time when the found validity of letters patent should (within the limitation mentioned) no longer be regarded as an open question is at least when such an adjudication

has been made by a Circuit Court of Appeals. If such an adjudication is properly to be questioned, it should be by a Court of not less than like jurisdiction and equal authority.

These views call upon us to accept the finding of invention and that the inventive thought embodied in plaintiff's appliance is absent from the patent applications cited for reference. This brings us to the question of anticipation evidenced by prior uses not before brought to judicial notice. The ruling which we deem to be authoritative disposes of the effect of the proceedings in the Patent Office affecting the applications as to which an interference was declared because these proceedings were before the Court which made the adjudications. Respecting the newly evidenced prior uses, they [fol. 182] are not in themselves of the character which show that what Callahan has been found to have invented was anticipated by the invention of another. Indeed anticipation in a construction of this kind can never be shown with that clearness which will defeat a patent. All such structures are ephemeral, and no record is ever kept of what they are. The real significance of prior constructions is in their showing such a state of the art prior to the entry of Callahan as to forestall any finding of invention in what he did, or at least to take from him the credit of being the pioneer which (in the absence of this evidence) the Court of Appeals for the Sixth Circuit found him to have been. The inference is justified that if that Court had denied him the credit given, its finding would not have been what it was. This is because of the emphasis given to the finding that he was such pioneer.

We are not persuaded, however, that the evidence before us so far differs from the evidence in the former case as to compel a different finding from that then made. We feel, however, that defendant has a right to the expression of our conviction that had such finding of invention not been made, the evidence before us bearing upon the prior state of the art would have led us to the conclusion that no invention is disclosed by plaintiff's appliance, at least further than to confer upon him the right to a patent limited to the specific special construction which the patentee devised.

The final question is that of infringement. Here we are on new and different ground from that trod by the parties to the other cause. This question is before a Court for the first time. Accepting the finding of invention already made, which we have accepted and do now accept, the question is whether the invention thus found has been encroached upon by this defendant. The fifth claim defines the right found to belong to the plaintiff. The invention [fol. 183] there described is made up of a number of elements, every one of which had been found to be old. This finding is in practical effect binding upon us, and without it would be made by us. Invention and novelty must therefore be in the combination. The "boom" feature or element is the keystone of the arch of this combination. It is to be found not merely in the claim and in the application but also in the drawings and in the constructed appliance which embodied the invention claimed. Plaintiff advances and relies upon two propositions, neither of which we are able to accept.

One is that the two elements of conduit and supporting boom do not mean two integers or units, but that the conduit itself may be both, if it is both a conduit and a boom. This has not been found to be nor do we find it to be the meaning of the claim. The boom element is a boom "carrying the conduit." This ex vi termini means two entities—conduit and boom. There are not only functionally but physically two elements (among the others) in the combination. If the boom is made to also serve the purpose of a conduit or the conduit of a boom, there is physically only one element, although it has a double function.

The other proposition comes in practical effect to this that if an inventor goes to the prior art and takes therefrom five elements, which he puts together in a combination constituting a patentable invention, and another man goes to the possession of the same art and takes therefrom four of these same elements, of which he makes a combination, thereby creating an appliance which will serve the same purposes and do all the work of the first and do it equally well, the two appliances are in a patentable sense the same. They are not. The invention is not in the elements nor in any one or more of them but in the combination and the combination is not the same [fol. 184] but a different one. The inventions are likewise not the same but different inventions.

The counter proposition which we advance is not in conflict with the doctrine of equivalents nor with the long line of cases to which we have been referred, which hold that a defendant cannot escape the charge of the infringement of a patented combination by devising an appliance which depends for its efficiency upon the presence of the patented combination but in which he has incorporated added elements which play no part in the combination. It is clear that what he has done is nothing but an attempt to hide infringement, not to avoid it.

The proposition on which we rely goes to the length that the man who has access to an art, rich not only in known elements, which may be combined, but rich also in number of combinations, and with the material thus supplied makes a new combination made up of a less number of elements than were before combined and yet one which in functions and results is all which the earlier combinations are, has not only infringed but has made a distinct advance in the art. Of course, the statement of the proposition must be understood to mean nothing more or less than what is expressed. It does not mean that elements may be added which give no added function nor that elements may be dropped so that the new aggregation may give some of the results of and thus be a partial substitute for the patented combination. In the former case infringement will always be found, and in the latter it may be found. When, however, as the proofs in the instant case show (what was not before shown) that those who practiced the art used appliances constructed of various combinations of these known elements, and all that the patentee did was to devise a special make of apparatus constructed [fol. 185] upon the principle of a combination of a given number of these known elements which has the merit of being a better ap-

pliance than those made up of fewer or other elements, all that the patent gives is a monopoly of that make of appliance. He cannot force the trade to use his superior make nor levy tribute upon it for the use of appliances which are not his appliance nor deprive the trade of the right before enjoyed of making appliances out of what the art supplied so long as the appliances which were thus made are not his appliance nor the equivalent of it. Chute conduits were in common use. They had to be supported or be constructed of sufficient strength to be self supporting. Either was expensive and otherwise open to objection. The thought of a "boom" to carry the conduit was an advance. In many respects the construction was a better construction. This, however, gave the inventor of the boom construction no property right in a self-supporting conduit construction, and he does get the right by calling the conduit a boom. Of course, in a sense it is, and it may be that what this patentee invented was a conduit with the added functions of a boom. If so, however, this is not what he claimed, nor what was patented to him, and he gets not what he invented nor all which he invented, but only what was patented. The present plaintiff has no shadow of claim to more.

Our finding is that the defendant has not infringed and that the bill should be dismissed for want of equity.

The propositions of law upon which the ruling made depends are not in conflict with any of the cases to which we have been referred, including

Capital v. National, 70 Fed. 709;
International v. Brammer, 138 Fed. Rep 396;
McCormick v. Aultman, 69 Fed. Rep. 371.

[fol. 186] The bill of complaint is dismissed, with costs to defendant. To give definit-ness of date for appellate or other purposes to the decree indicated, it is not now made but the draft or a formal decree to this effect may be submitted.

IN UNITED STATES DISTRICT COURT

OPINION SUR REARGUMENT—Filed October 31, 1922

DICKINSON, *J*:

The defendants had in use at different stages of a construction job two different forms of appliances and apparatus for placing the concrete part of the work. The appliances and apparatus constitute in themselves each a structure. They are distinguished in this record as "Defendant's apparatus" and "Defendant's second structure." The special feature with which we are now concerned is what has been designated as a "Boom." The word has been borrowed from the nautical art to express the special function which a part of the patented hoisting apparatus has. The primary func-

tion of a boom is to keep the foot of the mainsail or other sail extended. This gives the name. It incidentally, and indeed of necessity, is adapted to accompany, and in fact facilitates, prescribed movements. These features of a boom are so prominent that they have come to be regarded as its special and peculiar functions, and because of them the word has been carried into the art under present consideration. These functions are in this art merely incidental although again necessary to be present. The primary and real function is to support the conduit. It has an adjustable attachment to [fol. 187] the mast enabling it to be freely raised and lowered vertically; to be swung in any horizontal plane or be tilted to any desired angle, but its real function is that above stated. If we have the right concept of the prior art structures and the advance made by the patentee, it was in the improvement made by providing a boom support for the chute or trough down which the concrete was conducted when in its wet state. "Defendant's apparatus" was without this boom. Inasmuch as the opinion made no specific reference to "Defendant's Second Structure" a formal reargument was allowed in order to get the desired finding upon the record. The finding of infringement was intended to include both structures. The state of the prior art as disclosed in the case in 262 Fed. Rep., 958, was such that the Court in that case found the patentee had made an advance in the art so marked and so meritorious that he should be deemed a pioneer.

The state of the prior art, as disclosed by the evidence in the instant case, is such that it is confidently asserted a finding against the patentee should be made and the patent issued held to be of no validity. The ruling made in the cited case, however, we have felt to be controlling, and the reasoning by which reached, on the evidence before that Court, convincing.

The evidence presented now, however, compels the finding that the sole merit in the patented apparatus consists in the introduction as a feature of the apparatus, of a boom whose function is to support the conduit part of the combined structure. "Defendant's apparatus" made use of a self-supporting conduit. Many of the conduits before in use were, however, supported. A number (perhaps all) were supported in such a way as to prevent the free swing or movement of the conduit. Any support which has the character-[fol. 188] istics of a boom support, and in that sense was an equivalent, would call for a finding of infringement. Any contrivance, however, would not be equivalent to a boom construction merely because the two appliances had the supporting function in common. The patentee has no monopoly of any form of construction unless it incorporated the boom support feature.

Our finding was and is that neither of defendant's structures or appliances in use contain as an element this boom feature. Halyards, topping lifts, braces or the like, would, it is true, make of any trough or conduit (with the other features present here) a boom in a sense. None of these, however, would make a boom support in the sense in which the word is used in the patentee's application and claims because there would be no conduit carrier or supported

by a boom, and none of the benefits of such a contrivance would be gained. This thought and these benefits make plaintiff's apparatus patentable, and to this it must be held.

The draft of a decree, as before outlined, may be submitted.

IN UNITED STATES DISTRICT COURT

SUPPLEMENTAL FINDING—Filed November 6, 1922

DICKINSON, J.:

We are asked to make a further formal additional ruling in this case. The requested ruling concerns the deposition of Charles W. Ellis and covers the question of the general admissibility of any deposition because evidence offered out of time and out of order; the question of whether the deposition as offered is within the scope of the motion to take additional proofs and whether the testimony of the witness to which specific objections were made is admissible.

We did not pass upon any of these questions because the dis- [fol. 189] position made of the case rendered the whole of the deposition valueless. The parties, however, desire the ruling now asked for to be made, and we accordingly make it.

Trials of equity cases are now assimilated to trials of actions at law when the Courts sit without the assistance of the jury. In this view of it whether the testimony of a witness who is called out of order or who is called after that line of testimony has been closed should be admitted as a question wholly for the exercise of the discretion of the trial Judge. We exercise that discretion in favor of opening the door to the admission of this testimony so far as it is otherwise admissible.

The second objection to the admission of the testimony that it is beyond the scope of the permission granted to take additional testimony is of like character with the first objection, and a like ruling is made thereon.

The objections, however, made to a number of the statements credited to the witness on the ground that he was testifying to matters objectionable as hearsay are sustained, and the testimony of the deponent as a witness in the cause is excluded except as to these matters of which he showed a personal knowledge. In other words, the substance of the testimony of this witness is reduced to the proposition of fact that at the times of his visits to the various localities mentioned he saw in use the appliances and apparatus to which he referred, and the character of them so far as he has described them, and to his negative testimony that although in a position to have known it, he had no knowledge that the users of these appliances had paid a royalty, or been licensed by the Concrete Appliances Company for such use. This negative statement goes only to the weight of whatever evidence there is in the cause [fol. 190] that users of these appliances had so paid for the right to use them.

We think the foregoing covers all the essential rulings worth while to be made with respect to this deposition. To follow the whole of the testimony for the purpose of making specific rulings upon every objection made would be almost interminable. There is, however, one other possible question which we do not understand to be pressed. In case it should be, we make a ruling upon that also. It is substantially that a deposition taken in support of an interlocutory motion is not admissible as a deposition expressly taken for trial purposes. When, however, a witness has deposed just as he would have deposed if the deposition had been in form for trial purposes, and he has been fully examined and cross-examined, we see no occasion to require him to give his deposition a second time merely to cover this purely formal difference. A deposition so taken may be admitted for trial purposes as if, although taken primarily in support of a motion, it had been taken secondarily by anticipation as a trial deposition to be accepted or rejected as the Court should determine. We have so regarded and so treated this deposition.

An exception is allowed to the respective parties for every ruling now made whether of admission or rejection of the testimony embodied in this deposition.

IN UNITED DISTRICT COURT

DECREE—Filed November 20, 1922

This cause having come on to be heard upon complete proofs, and upon oral arguments and briefs presented by counsel for the respective parties, it is hereby,

[fol. 191] Ordered, adjudged and decreed—

1. That the apparatus complained of in this cause, as constructed and used by the defendants herein, does not infringe any of the claims of said letters patent, in issue.

2. That the bill of complaint herein be, and the same is, hereby dismissed for want of equity at the cost of said plaintiffs, the same to be taxed; and that the defendants have execution therefor.

By the Court, Dickinson, United States District Judge.
Dated November 20, 1922.

Approved as to form: Cyrus N. Anderson, Solicitor for Plaintiffs; George Bayard Jones, Solicitor for Defendants.

IN UNITED STATES DISTRICT COURT

DEFENDANTS' BILL OF COSTS—Filed December 26, 1922

1920.			
		Attorneys' docket fee	$20.00
		Drawing defendants' answer	16.50
July	31.	Photoprints of concrete apparatus offered in evidence later	1.70
Aug.	5-10.	Cost of photographs and blue prints of Cincinnati and St. Louis uses, later offered in evidence, and later duplicates for opponent	25.70

[fol. 192] Defendants' Bill of Cost

1920.			
Aug.	7.	Cash paid for certified copies of the Engineering News from Patent Office	5.80
"	"	Cash paid for certified copies of preliminary statements in Callahan-Smith interferences	4.10
"	18.	Cash paid for further certified copies of preliminary statements of Callahan and Emtman	1.20
Sept.	23.	Photographic reproductions of St. Joe, Mo., building, Exhibit 14	1.20
"	30.	Cash paid Eastman Bros. for printing answer	15.00
Nov.	3.	Certificate of Clerk of District Court re Witherspoon-Englar suit, part of Exhibit 65	.50
"	30.	Negatives and duplicate photoprints of original photographs of Great Lakes Dredge & Dock Co., Exhibit 17	11.90
"	"	Services of Notary Public in taking depositions of witnesses Woodward, Woodman, Mensch, Sinks and Cameron	124.00
1921.			
Jan.	19.	Certified copy of further interference papers in Smith v. Emtman	.75
"	21.	Photographs of Exhibit 24, Culp Sketch	.70
"	22.	Witness and subpœna fees re deposition of A. L. Smith	1.75
"	31.	Notarial charges for taking deposition of of A. Smith in Washington January 14.	20.00

[fol. 193]

Jan.	31.	Notarial charges for depositions of Preston and Tatterson	44.00

Jan.	31. Notarial charges for taking deposition of A. E. Culp in Cincinnati, January 19...	13.63
"	" Notarial charges for taking depositions of Alderman, Cameron, Creutz, Patterson and Anderson in Chicago.....	65.00
Feb.	14. Photoprints of fifteen magazine pages.....	15.00
"	" Notarial charges for St. Louis depositions of Bankes, Bansack, Black, Goebel, Hopkins, Hughes and Webb.....	95.75
"	" Blue print exhibits.....	2.04
"	" Blue print of Iroquois plant (Ex. 27)....	.25
"	19. Disbursements to United States Marshal in St. Louis for subpœnaing Bankes.....	1.00
"	25. Notarial charges for taking depositions of Stimson, Blake and Squires in Chicago..	56.00
Mar.	16. Cash paid for Notarial services in Los Angeles	5.00
"	25. Two copies of old Engineering Record exhibits	.70
"	26. Cash paid Los Angeles photographer for photographic exhibits No. 44.....	9.40
"	31. Cash paid Laird Stenographic Agency for Los Angeles depositions.....	95.00
April	2-4. Cash paid Notary Public for taking depositions of Bannister, Fucik, Folewell and Hughes	59.40
[fol. 194]		
April	5. Cash paid Notary Public in Jackson, Mich., for deposition of Fargo.....	3.75
"	21. Photoprints of Bannister exhibits.....	.70
"	22. Reproductions of Weber Dam photographs, exhibit.....	1.00
May	10. Notarial services in Los Angeles for depositions of Wetzel and Johnson.....	5.00
"	" Typists's charges for transcribing depositions	25.00
"	" Balance due Laird Stenographic Agency, Los Angeles, for same.....	2.50
"	31. Blue prints of San Francisco drawing, Exhibit 61.....	.25
"	" Paid Owen, Notary Public, for remaining San Francisco depositions (Horton, Brown, Ayer)	69.00
July	30. First of three installments to printer for printing record in suit.....	300.00
Aug.	31. Second installment for record.....	300.00
Sept.	30. Balance paid for printing record.....	391.20
"	" Certificate of title of Callahan patent.....	5.00
Oct.	3. Cash paid Philadelphia Court reporters for typing open court testimony.....	25.00

party defendant of record, has agreed to contribute in whole or in part to the expense of the litigation and that the costs asked to be taxed were costs paid not by the record defendants but by the contesting defendant. The exception is not based upon the doctrine of champerty or maintenance but upon the mere fact that the party to whom the costs are asked to be allowed had not in person made the outlay.

We content ourselves, without discussion of the reasons for so doing, with the dismissal of the exception.

The second exception is to the allowance as costs of the premium paid to the surety on the bond given by defendants following a motion by the plaintiff for a preliminary injunction. As the allowance of such an injunction would have interfered with construction work then in progress, the Court anticipating and hoping to escape discussion of the questions which it was foreseen would be raised, [fol. 199] inquired of the plaintiff to learn whether it would be satisfied with a bond assuring the payment of such damages as might be recovered and upon receiving an affirmative answer from the plaintiff, then inquired of the defendants whether they were content to give such bond, and upon an expression of their willingness so to do pro forma denied the motion for a preliminary injunction upon the entry of an accepted bond such as above indicated. The bond in a substantial sense was a voluntary one entered into by the defendants for their benefit and convenience. The case being one on the Equity side of the Court, the allowance of costs is in any event discretionary, and if this portion of the costs be not allowed to the defendants as costs, it is unnecessary to go into the inquiry of whether or not this item is properly a part of the costs generally allowed. This may require, however, a modification of the decree heretofore entered dismissing the bill, with costs to the defendants, and the decree heretofore made is accordingly modified and amended so as to be a decree dismissing the bill, with costs, as heretofore formerly decreed, except this item of defendants' bill, which is not allowed to them as costs.

The second exception is formally allowed, and the sum of the costs as taxes is reduced from the sum of two thousand three hundred and twenty-nine and fifty-nine hundredths dollars ($2,329.59) to the sum of two thousand one hundred and nineteen and sixteen hundredth dollars ($2,119.16).

[fol. 200] IN UNITED STATES DISTRICT COURT

ORDER ON EXCEPTIONS TO TAXATION OF BILL OF COSTS—Filed January 22, 1923

Before Dickinson, J.

A final decree dismissing the bill of complaint with costs to defendants having been entered herein the twentieth day of November, 1922, and the clerk having taxed defendants' costs in accord-

ance therewith in the sum of two thousand three hundred and twenty-nine dollars and fifty-nine cents ($2,329.59), which sum included two thousand one hundred and sixty-two dollars and nine cents ($2,162.09) not expended by defendants but by a party not a party to the record which latter amount included the sum of two hundred and ten dollars and forty-three cents ($210.43), paid by such party to a surety company as premiums on a bond; and plaintiffs having filed exceptions to the said bill of costs as taxed on the grounds (1), that it was error to tax as costs items of expenditure not made by the defendants, but by a party not a party to the record, and (2), that it was error to tax as a part of the costs the items expended as premiums for said surety bond, and the said exceptions having been argued by counsel for the respective parties, and upon consideration of the said exceptions it is,

Ordered, adjudged and decreeed, as follows, to wit:

1. That the first of said exceptions be and the same hereby is dismissed.

2. That the second of said exceptions be and the same hereby is allowed.

3. That the paragraph numbered 2 of the decree of November 20, 1922, be amended to read as follows:

"That the Bill of Complaint herein be, and the same is, hereby [fol. 201] dismissed for want of equity at the cost of the said Plaintiffs, except that costs for the premiums for Defendants' bond are not allowed, the costs allowed to be taxed"; and

4. That defendants' costs be taxed in the sum of two thousand one hundred and nineteen dollars and sixteen cents ($2,119.16), and that said defendants have execution therefor.

By the court.

Attest:

George Brodbeck, Clerk.

Dated January 22, 1923.

Approved as to form: Cyrus N. Anderson, Solicitor for Plaintiffs; Wm. Steell Jackson, Solicitor for Defendants.

In United States District Court

Stipulation as to Payment of Costs—Filed January 30, 1923

In order that the record in this case on appeal as to the payment of costs by parties not defendants here and who have not intervened may be complete, counsel stipulate:

That at the hearing before the clerk of court upon taxation of costs, solicitor for plaintiffs urged that the outlays sought to be taxed as costs had not been paid by the actual defendants in the cause but had

been paid by parties not of record as defendants nor as interveners in the cause; and that solicitor for defendants freely admitted the fact and stated that all the expenses of defending the suit had been [fol. 202] assumed by Sackett Screen and Chute Company of Chicago, the manufacturer of the machinery of whose use complaint was made and that all of the outlays included in the costs sought to be taxed except one item of six dollars ($6.00) had in fact been paid by Sackett Screen and Chute Company and another.

That prior to the hearing in the District Court on exceptions from the clerk's taxation of costs solicitor for defendants submitted a memorandum on behalf of defendants setting forth the fact that all of the outlays sought to be taxed as costs except six dollars ($6.00) had been paid by Sackett Screen and Chute Company, the manufacturers, and Archer Iron Works of Chicago.

That the payments by Sackett Screen and Chute Company and Archer Iron Works of the outlays sought to be taxed were freely stated and admitted by solicitor for defendants at the oral hearing in the District Court and were accepted as the fact upon which the opinion of the Court was based.

That the fact of the payment of these outlays by Sackett Screen and Chute Company and Archer Iron Works, for and on behalf of the defendants in this cause is stipulated nunc pro tunc as a matter of record at the time of the hearing before the clerk of the court upon taxation of costs, with the same force and effect as if this fact had been formally of record at that time.

(Sgd.) Cyrus N. Anderson, Solicitor for Plaintiffs. Wm. Steell Jackson, Solicitor for Defendants.

Philadelphia, Pennsylvania, January 30, 1923.

[fol. 203] IN UNITED STATES DISTRICT COURT

PETITION FOR AND ORDER ALLOWING APPEAL—Filed January 30, 1923

The above-named plaintiffs, conceiving themselves aggrieved by the decree made and entered on the twentieth day of November, 1922, in the above-entitled cause and by the order made and entered the twenty-second day of January, 1923, in said cause, the latter being in part amendatory of the said decree, do hereby appeal from the said decree and order to the United States Circuit Court of Appeals for the Third Circuit for the reasons specified in the assignment of errors, which is filed herewith, and they pray that this appeal may be allowed, and that a transcript of the record, proceedings and papers upon which said decree and order were made, duly authenticated, and that the various physical exhibits filed on behalf of the respective parties may be sent to the said United States Circuit Court of Appeals.

Arthur M. Hood, Cyrus N. Anderson, Attorneys for Plaintiffs.

Before Dickinson, J.

The foregoing claim for appeal is allowed upon filing cost bond in the sum of $2,500.

By the court.

Attest:

George Brobeck, Clerk.

Philadelphia, Pa., January 30, 1923.

[fol. 204] IN UNITED STATES DISTRICT COURT

ASSIGNMENT OF ERRORS—Filed January 30, 1923

Come now the plaintiffs, by Cyrus N. Anderson, their solicitor, and say that in the record and proceedings and decree in this cause, there is manifest error in this, to wit:

First. The Court erred in holding and deciding that claims 1, 2, 5 and 13 of the Callahan patent sued upon are not infringed by the structures of the defendants.

Second. That the Court erred in dismissing the bill of complaint for want of equity.

Third. That the Court erred in awarding costs to the defendants.

Fourth. That the Court erred in awarding to the defendants, as items of taxable costs, items of expenditure amounting to one thousand nine hundred and fifty-one dollars and sixty-six cents ($1,951.66) not expended by defendants but expended on behalf of defendants by a party not a party to the record, said items, excepting a single item of six dollars not included therein, being all of the items of alleged taxable expenditure.

Fifth. That the Court erred in granting a decree for defendants, whereas, said decree should have adjudged that the defendants had infringed claims 1, 2, 5 and 13 of the aforesaid Callahan patent and that said Callahan patent was valid.

Wherefore the plaintiffs pray that the said decree be reversed.

(Sgd.) Cyrus N. Anderson, Solicitor for Plaintiffs.

Philadelphia, Pa., January 30, 1923.

[fol. 205] IN UNITED STATES DISTRICT COURT

PRÆCIPE FOR TRANSCRIPT OF RECORD—Filed January 30, 1923

To the clerk of the court:

You will please prepare a transcript of the record on appeal in the above-entitled cause and include therein the following:

Bill of complaint.
Answer.
Amendment to answer.
Testimony of defendants' witnesses Thompson and Insley in open court.
Defendants' printed record.
Plaintiffs' printed record.
Testimony of defendants' witnesses Williams and Bruner in open court, and deposition of Charles W. Ellis.
Testimony of plaintiffs' witnesses Ginsburg, Engstrum and Insley in rebuttal in open court.
Testimony of defendants' witnesses Horton and Ayre, and of plaintiffs' witnesses Kebby and Tibbitts taken in California after final hearing.
Decree.
Opinions of Judge Dickinson.
Defendants' bill of costs as taxed.
Petition for appeal.
Assignment of errors.
Bond.
Citation.
Plaintiffs' exhibit N, patent in suit.
Defendants' exhibits 36, 38, 63, 67 and 68.
Exceptions to defendants' bill of costs.
Order of January 22, 1923.
Defendants' interrogatories.
Plaintiffs' answers to defendants' interrogatories.
[fol. 206] Stipulation as to payment of costs (dated January 30, 1923).
All other exhibits are to be forwarded to the Court of Appeals, under agreement of counsel, as physical exhibits.

Arthur M. Hood, Counsel for Plaintiffs.

Indianapolis, Indiana, December 16, 1922. Chicago, Illinois, December 18, 1922.

Approved. George Bayard Jones, Counsel for Defendants.

[fols. 207 & 208] In United States District Court

Clerk's Certificate

United States of America,
Eastern District of Pennsylvania, set:

I, George Brodbeck, clerk of the District Court of the United States for the Eastern District of Pennsylvania, do hereby certify that the annexed and foregoing is a true and faithful copy of so much of the pleas and proceedings in the case of Concrete Appliances Company and William H. Insley v. John E. Gomery, John C. Schwartz,

Michael J. O'Meara, and Concrete Construction Company, No. 2067, June Term, 1921; as per præcipe filed, a copy of which is hereto attached, the transcript of record in the above-entitled cause is to include, now remaining among the records of the said court in my office.

In testimony whereof I have hereunto subscribed my name and affixed the seal of the said District Court at Philadelphia, this twenty-sixth day of February, in the year of our Lord one thousand nine hundred and twenty-three and in the one hundred and forty-seventh year of the Independence of the United States.

George Brodbeck, Clerk. (Seal.)

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209-211

DEFENDANTS' EXHIBIT 66

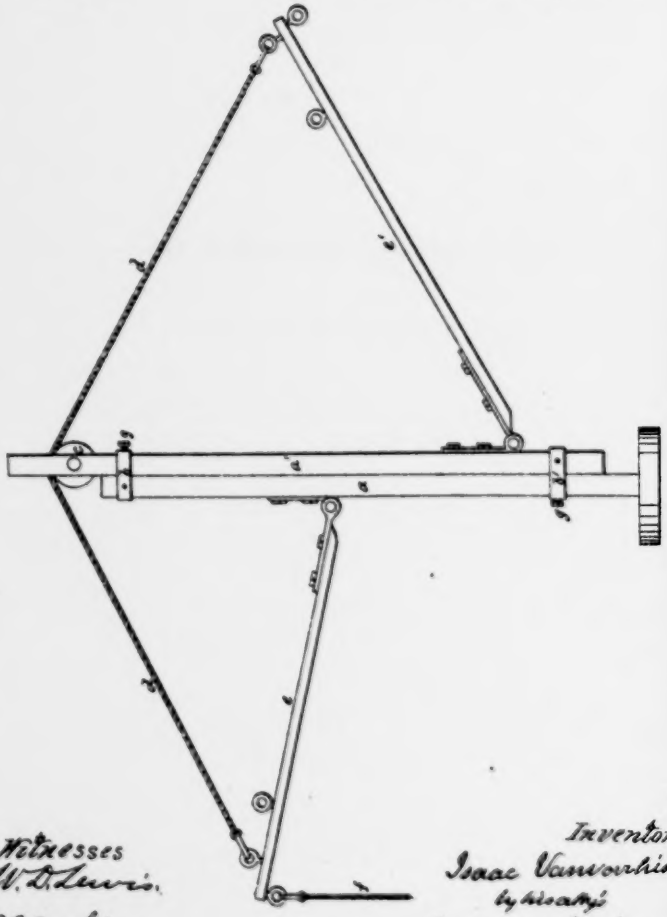
PATENTS SET UP IN ANSWER

666
212

I. Van Voorhis,

Derrick.

No. 69,375. Patented Oct. 1, 1867.



Witnesses
W. D. Lewis.
G. B. Bushing.

Inventor
Isaac Vanvorhis.
by his Att'y
Bakewell & Baldwin

667
213-215

UNITED STATES PATENT OFFICE.

ISAAC VAN VOORHIS, OF HILLSBOROUGH, PENNSYLVANIA.

IMPROVEMENT IN HAY-DERRICKS.

Specification forming part of Letters Patent No. **69,375**, dated October 1, 1867.

To all whom it may concern:

Be it known that I, ISAAC VAN VOORHIS, of Hillsborough, in the county of Washington and State of Pennsylvania, have invented a new and useful Improvement in Derricks and Hoisting Apparatus; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, making part of this specification, which is a side elevation of my improved derrick or apparatus for hoisting.

The nature of my invention consists in the construction of an improved derrick for raising or hoisting large bodies or heavy weights.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

The main post *a*, of any desirable length and of sufficient size to secure the requisite strength, rests on a turn-table of the ordinary construction, or on any other desirable foundation, and is securely fastened thereto, or connected in such a way as to rotate at pleasure. It is usually made of uniform size its entire length with a square or rectangular transverse section. At or near its upper end, and attached thereto, is a band, *b*, made sufficiently large to encompass a similar post, *a'*, at or near the lower end of which, and attached thereto, is a similar band, *b'*, *b* and *b'* being so fitted as to allow the post *a'*, sliding along the post *a*, to be raised or lowered at pleasure. In the upper end of the post *a'* is a grooved or pulley wheel, *c*, over which passes a cord, rope, strap, or chain, *d*, one end of which is attached to the arm *e*, which is hinged to the post *a*, and the other end to the arm *e'*, hinged to the post *a'*. The weight to be raised is attached at or near the outer end of the arm *e'* by the hook represented in Fig. 2, or by other similar device in common use, and the hoisting-power similarly applied to the other arm, *e*, by a rope or chain, *f*, which may be worked by a capstan or other equivalent device, or by hand, as preferred.

The devices thus described are adjusted to each other and to weight and power in any desirable proportions, or they are so made that the relation of power, weight, and distance can be varied at pleasure, in accordance with the generally-known principles governing the application of power by levers and pulleys. The points on the arm *e'* at which the rope *d* and the weight are attached, also the points on the opposite arm, *e*, for attaching the ropes *d* and *f*, may any and all be varied at the pleasure of the operator, or according to the amount of power which is available or the work to be done. Commonly I provide two or more places on each arm *e* and *e'*, to which to attach the rope *d*. The places for hinging the arms *e* and *e'* may also be varied at pleasure, in accordance with the same general and well-known laws. The derrick thus described is very accurately balanced, and requires only to be braced or stayed sufficiently to steady it from falling by its own weight or prevent its swinging to either side when in actual use, unless the posts *a* and *a'* are set obliquely, which is seldom, if ever, necessary.

By the devices thus described I secure a derrick or hoisting apparatus self-balancing, and either portable or stationary, and applicable to any and all purposes of hoisting or lifting for which derricks are ordinarily used, or for which hoisting apparatus is required. For the purpose of raising the post *a'*, I employ a screw, lifting-jack, pulley, or any of the common mechanical powers in their ordinary forms of application, and hold it in position by screws *g*.

In the derrick as above described the two posts *a* and *a'* are not both necessary, though I generally so construct it. A single post may take the place of the two, the pulley *c* be pivoted in its upper end, the arms *e* and *e'* hinged to its opposite sides, and the mode of operation be substantially the same. Nor do I limit myself to the method of hinging specified in order to connect the arms *e* and *e'* to their posts *a* and *a'*, as I employ for that purpose any device in ordinary use which will give a firm working joint. The post *a'* may also be made in such a way that the pulley *c* can be hung higher or lower at any desirable point.

What I claim as my invention, and desire to secure by Letters Patent, is—

A portable self-balancing derrick consisting of one or more upright posts with arms hinged on opposite sides, such arms connected with each other in the manner described, and the whole operating substantially as and for the purposes above set forth.

In testimony whereof I, the said ISAAC VAN VOORHIS, have hereunto set my hand.

ISAAC VAN VOORHIS.

Witnesses:

EDWARD TAYLOR,

G. TAYLOR.

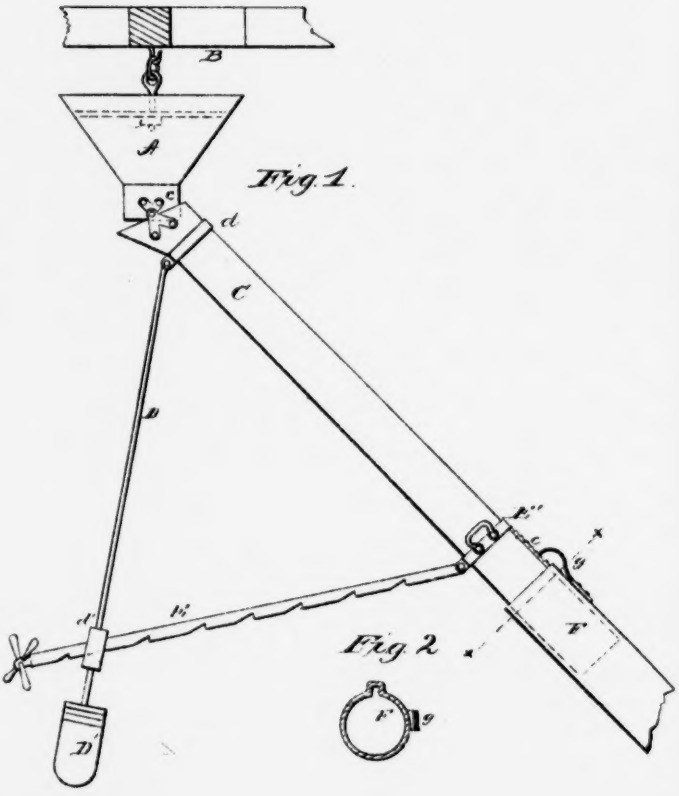
668
216

(No Model.)

W. TOEPFER.

Grain Distributer for Malt Kilns, &c.

No. 243,327. Patented June 21, 1881.



Witnesses.
Franck L. Durand
J. J. McCarthy

Inventor
Wenzel Toepfer
By S. S. Stout
Attorney

669
217-219

UNITED STATES PATENT OFFICE.

WENZEL TOEPFER, OF MILWAUKEE, WISCONSIN.

GRAIN-DISTRIBUTER FOR MALT-KILNS, &c.

SPECIFICATION forming part of Letters Patent No. 243,327, dated June 21, 1881.

Application filed April 11, 1881. (No model.)

To all whom it may concern:

Be it known that I, WENZEL TOEPFER, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Grain-Distributers for Malt-Kilns; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to devices for distributing grain as it is delivered from a higher to a lower level, and will be fully described hereinafter.

In the drawings, Figure 1 is a side elevation of my invention. Fig. 2 is a section on line *x x*.

A is the hopper, which is suitably hung beneath a spout, B, which passes from the upper floor by a link and eyebolt, which permit it to turn about a vertical center.

C is a delivery-spout, which is hinged to the hopper by brackets *c c*, and just below the brackets I securely attach a band, *d*, to the spout, and to this band I hinge a bar, D, upon which I suspend a weight, D'. I slightly enlarge the rod D just above the weight, and slot it to receive a notched bar, E, which I hinge to the lower end of the spout by band E'.

In the lower edge of the slot in bar D, I provide a catch, which is adapted to fit in the notches in bar E.

Just below the band E', I attach a strip, *e*, of angle or T iron to the spout C, which strip is notched to receive a spring-catch, *g*, that is fastened to an extension-spout, F, a longitudinal groove or crease in the extension-spout accommodating rib *e* and holding the extension-spout against any tendency to turn, so as to carry the spring-catch out of engagement with the notched strip.

Operation: The weight D', causing rod D to draw upon one side of the spout C, will have a tendency to throw the spout out of a perpendicular, and render it easy for a person at the handles of the bar E to thrust it the (spout) out farther, and thus distribute the grain uniformly throughout the floor, the notches in bar E engaging with a catch in the enlargement *d'* of rod D to hold the spout at any desired angle.

My device is specially designed for distributing malt on kiln-floors.

I design providing the spout and extension with suitable handles, by which they may be operated independently of bar E.

I claim—

1. In grain-distributers for malt-kilns, &c., a hopper having hinged spout, in combination with a rod, D, carrying a depending weight or counter-balance, as set forth.

2. In grain-distributers, the combination of the hopper and spout, hinged together, with the weighted rod D and notched bar E

3. In combination with the hinged spout having notched rib *e*, the extension-spout having groove and spring-catch, as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 21st day of March, 1881.

WENZEL TOEPFER.

Witnesses:
JOE MELICHAR,
S. S. STOUT.

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220–221

(No Model.) 2 Sheets—Sheet 1.

J. EDWARDS & J. R. F. KELLY.

DREDGING APPARATUS.

No. 366,468. Patented July 12, 1887.

Fig. 1.

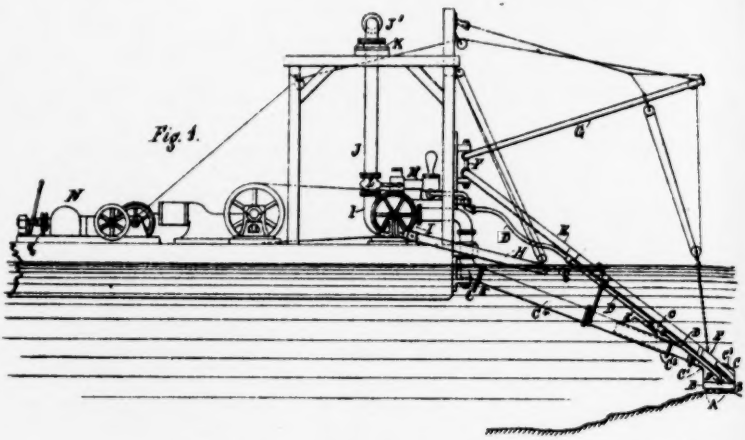
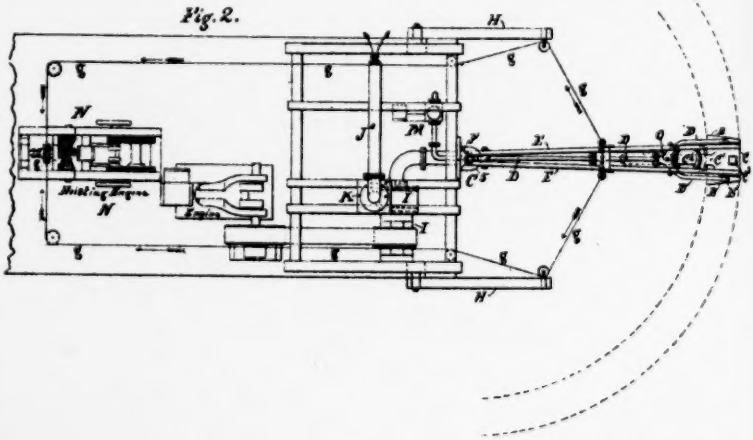


Fig. 2.



WITNESSES:
A. M. Pierce
M. E. Roberts

INVENTORS:
Joseph Edwards
James R. F. Kelly
for Wm. H. Weightman
atty

671

222

(No Model.) 2 Sheets—Sheet 2.

J. EDWARDS & J. R. F. KELLY.

DREDGING APPARATUS.

No. 366,468. Patented July 12, 1887.

Fig. 3.

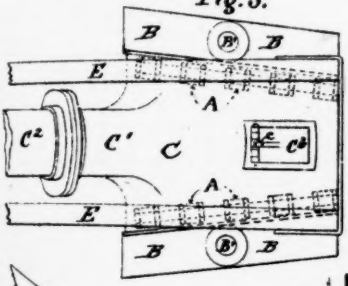


Fig. 4

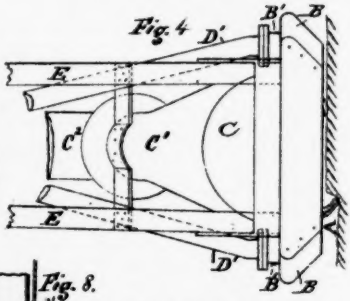


Fig. 5.

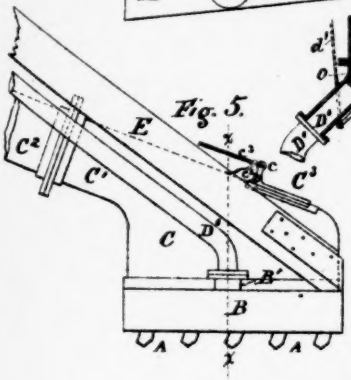


Fig. 8.

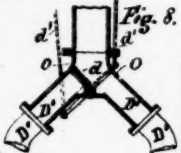


Fig. 6.

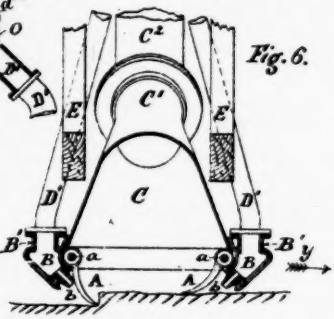
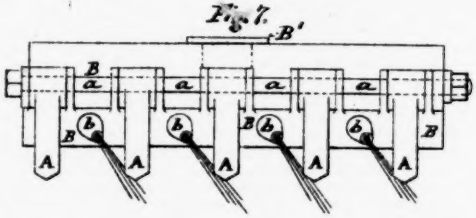


Fig. 7.



WITNESSES:-
A. M. Pierce.
M. F. Roberts.

INVENTORS:-
Joseph Edwards
James R. F. Kelly
per Wm. H. Deighton
atty

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UNITED STATES PATENT OFFICE.

JOSEPH EDWARDS AND JAMES R. F. KELLY, OF BROOKLYN, NEW YORK.

DREDGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 366,468, dated July 12, 1887.

Application filed February 14, 1887. Serial No. 227,302. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH EDWARDS and JAMES R. F. KELLY, citizens of the United States, residing in Brooklyn, Kings county, and State of New York, have invented certain new and useful Improvements in Dredging Apparatus, of which the following is a specification, reference being had to the accompanying drawings.

Certain improvements consist specially in a dredging-drag composed of a series of loosely-suspended diggers or plows, by means of which the earth or mud at the bottom of a river or harbor is loosened, of a series of pressure-jets arranged in conjunction with the loosely-suspended diggers or plows, by means of which a constant abrasion of the loosened mud or earth is brought about, and of an inverted funnel or nozzle to which the said diggers and jet-nozzles are attached, and up through which by suction the loosened material, mingled with water, is withdrawn for deposit elsewhere.

Certain improvements also consist in a special supporting frame-work projected from the dredging end or side of a staging, scow, or vessel directly to the dredging-drag, through which all support and necessary movement is conveyed in the operation of said drag, thereby preventing any direct or undue strain from coming upon the drag itself, the suction or discharge connections, the pressure-connections for jets, or upon the several bearings, swivels, and steps of the same.

Other improvements consist in the combination of the several portions or details, collectively or with each other, of which the dredging apparatus is composed, as may hereinafter be described or claimed.

In the drawings, Figure 1 represents a general elevation of a dredging apparatus embodying our improvements. Fig. 2 represents a plan view of the same. Figs. 3, 4, and 5 represent a plan, front and side view of a dredging-drag presenting improved details of construction and method of operation. Fig. 6 represents a transverse section on line $x\ x$ of Fig. 5 and through one of the jets, showing preferred method of putting the parts together. Fig. 7 is an enlarged view of manifold with four jets attached thereto and five diggers suspended from the same. The number of jets and loosely-suspended diggers may be increased to suit the nature of the bottom to be worked. The radial lines from jet-nozzles show method of directing the jets in their work. Fig. 8 is a detail view of flap-valve for supplying pressure to jets in either manifold to suit direction in which the work is being done.

Similar letters of reference designate like parts in all the figures.

A designates the loosely-suspended diggers; B, a pair of manifolds to which the jet-nozzles are secured, varying in size and number according to the nature and amount of discharge required.

C is an inverted funnel strongly framed, to which the manifolds B are attached, and from and within which the diggers are suspended. This inverted funnel C is formed, preferably, with an easy taper to the nozzle, up through which by direct suction the disintegrated material mixed with water is drawn. To prevent choking the suction, a water-valve, C', is attached to the upper portion of inverted funnel, and when too much material and too little water gets into the suction-pipes an extra and independent supply of water can be secured. To supply the manifolds with pressure, preferably of water, the inlets B' and connections D' to pressure pump are provided, the connections D being made flexible, preferably of rubber.

In the section, Fig. 6, a pair of manifolds are represented as attached to the siding of the inverted funnel C, and branch connections D' provided for each. These branch connections are continued up toward the vessel or scow and brought together at earliest opportunity in a Y-connection, as shown at O in Figs. 1, 2, and 8, and a flap-valve, d, (see Fig. 8,) set at the junction of the arms to control the inlet to either of the connections leading to manifolds B. The flap-valve d is controlled automatically or by power applied from the scow, staging, or vessel. As represented in the drawings, Fig. 8, the flap-valve d has a double handle, to the two ends of which hold is taken through cables d', either one of which being pulled closes the opposite branch connection leading to manifolds.

The water-valve C' may be a balanced valve,

which, upon internal suction being reduced, owing to the choking of the suction-connection, opens and admits a special supply of water automatically, or it may be operated as shown in Fig. 5, where hold is taken of the handle by cable or rod c' at the handle c. The maximum of weight being on the side of the valve, it will shut as soon as released and open when a strain is put upon the cable. A spring, c^2, may be located behind the valve to assist in the closing, or the suction of the funnel may assist.

The manifolds B are shown set at an angle to each other and to the radius of movements, (see Fig. 3;) but the funnel C may be shaped to suit choice or requirements, the neck C' being of any suitable length, and the manifolds and diggers attached below, as shown in Fig. 6.

To effect necessary movement or travel of the dredging-drag and provide for its successful operating, a supporting frame-work, as shown at E, is attached to it and continued to a staging on shore or to a scow or vessel on water, as may be necessary. Here the frame-work is attached to a self-adjusting hanger, F, to permit of radial movement in any direction. The framing being stiff and non-elastic and being rigidly attached to the drag, takes all the thrust and strain of movement and work and relieves the several flexible connections and bearings from undue strain. A boom, G, is similarly connected to the vessel and extended upward and outward above the drag-framing E, from which the drag, by means of cables, is raised or lowered, as required. Side cables, g, are provided and connection made with hoisting engine or power to move the drag in a circular path, controlled by central attachment, F. These cables g are attached to framing E well down toward the drag, and the direction of their pull is controlled by the adjustable side timbers, H. These timbers are raised and lowered at their outer ends to suit depth of water and angle of bearing timbers or framing E. To provide for a free movement of the drag, a telescopic expansion-joint, C^3, in the suction-connection permits of extension or shortening, as required. A rubber suction-hose forms part of suction connection at C^3 to accommodate varying depth of water and cut. These several portions are securely suspended from or attached directly to the frame-work E. Beyond the branch connections O of the pressure-pipes a flexible connection, D, is made to accommodate the varying reach and depth of dredging already referred to. Both suction and pressure connections are preferably provided with swivel-joints, as at C^2, attached to the vessel, placed in direct center line of drag movement and frame-center F.

A suction-pump, I, is placed on the vessel and connection made with suction-funnel of the drag. A discharge-pipe, J, is erected to connect with pump I, and is provided with a swivel-joint, K, and swinging branch J'. This branch J', being swung upon swivel-joint K, permits of a free discharge in any direction radiating from K as a center.

To operate the apparatus, pump I, preferably a cataract or pulsometer pump, is started, with the discharge-valve L in pipe J partially open, and such opening is gradually increased until full suction is obtained. The force-pump M is operated to supply pressure for jets b, and the drag being lowered to place, the side timbers, H, are adjusted to a direct pull of the cables g in either direction and the drag moved to and fro upon F as a center. The diggers A are loosely suspended from rod a, and, being backed by the manifold and funnel-framing in their work, drop by gravity into position for digging. Under such circumstances, when the drag is moving in a direction as indicated by arrow y, Fig. 6, the left-hand set of diggers drop to their work, while the right-hand set drag idly over the surface of river-bottom, and vice versa, with the movement of the drag. In either case the flap-valve d of connection O is swung to suitably operate the jets upon the diggers while at work. Thus the diggers loosen the earth or mud, the jets break it up and mix it with water, and the suction, drawing it up, passes it through the discharge-connections, to be deposited in any direction from the vessel.

What we claim as new, and desire to secure by Letters Patent, is—

1. A dredging-drag consisting of an inverted suction-funnel, to the lower portion of which are attached manifolds provided with jet-nozzles and a series of loosely-suspended diggers, substantially as set forth.

2. A dredging-drag consisting of an inverted suction-funnel, to the lower portion of which are attached manifolds provided with jet-nozzles, and a series of diggers loosely suspended within said inverted funnel, in combination with a relief water-valve, substantially as and for purposes specified.

3. A dredging-drag consisting of an inverted suction-funnel, to the lower portion of which are attached manifolds provided with jet-nozzles and a series of loosely-suspended diggers, in combination with means for raising, lowering, and placing the same, substantially as shown and described.

4. In combination with a dredging-drag consisting of an inverted suction-funnel, to the lower portion of which are attached manifolds provided with jet-nozzles and a series of loosely-suspended diggers, the supporting frame-work to which said dredging-drag is attached, the swing-center F, and means for operating the same, substantially as set forth.

5. In a dredging-drag, the combination of an inverted suction-funnel, a series of manifolds, B, provided with jets b, and a series of loosely-suspended diggers suspended directly from said manifolds, substantially as set forth.

6. In a dredging apparatus, the combination of the dredging-drag herein shown and described, expansion-joint C^3, flexible joint C^1, swivel-joint C^2, and pressure-connections D, O,

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and D', substantially as and for purposes set forth.

7. In a dredging apparatus, the combination of a dredging-drag of the character herein shown and described, pressure-connections D, branching connections O, side connections, D', and manifolds R, substantially as and for purposes specified.

8. In a dredging apparatus, in combination with a dredging-drag consisting of an inverted suction-funnel, to the lower portion of which are attached manifolds provided with jet-nozzles and a series of loosely-suspended diggers, supporting frame-work E, carrying said drag, boom G, a vessel or staging to which said supporting frame-work and boom are attached, and means for raising, lowering, and operating said drag, substantially as set forth.

9. In a dredging apparatus, the combination of the dredging-drag herein shown and described, suction-connections C^3, C^4, and C^5, water-valve C^6, pressure-connections D, O, and D', suction-pump I, and pressure-pump M, all substantially as and for purposes set forth.

10. In a dredging apparatus, the combination of a dredging-drag of the character herein specified, suction-connections C^3, C^4, and C^5, suction-pump I, discharge-connections J and J', and swivel-joint K in discharge-connection J, substantially as and for purposes specified.

11. In a dredging apparatus, the combination of a dredging-drag of the character herein specified, a supporting frame-work, E, suction and pressure connections, as specified, suction-pump I, pressure-pump M, and discharge-connections J and J', provided with a swivel-joint, K, substantially as and for purposes specified.

JOSEPH EDWARDS.
JAMES R. F. KELLY.

Witnesses:
WM. H. WEIGHTMAN,
M. E. ROBERTS.

228–229

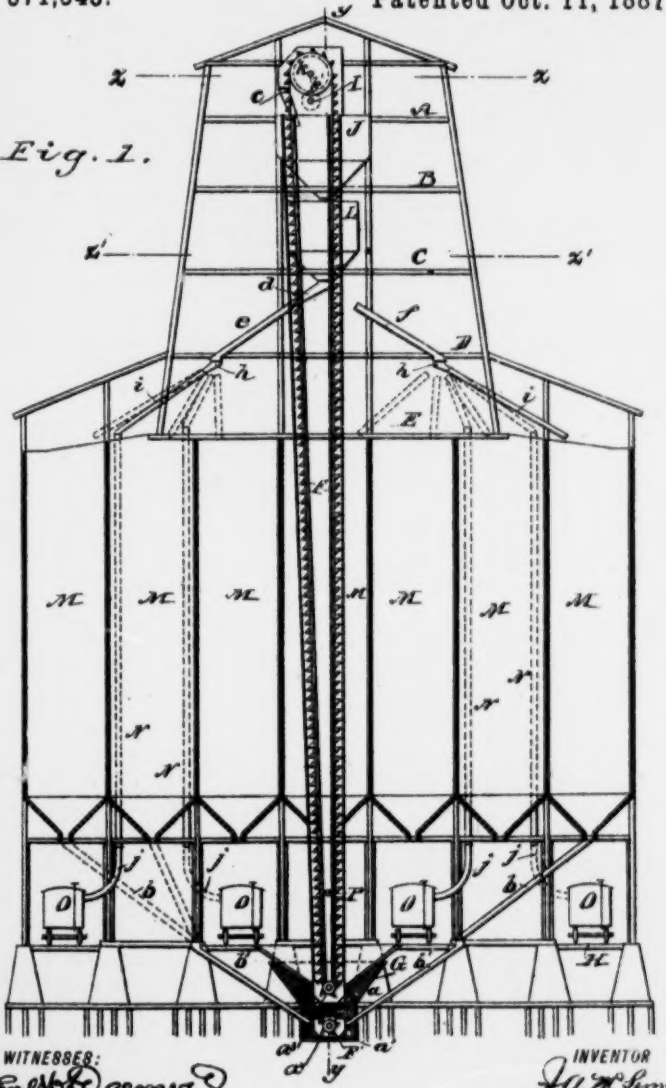
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J. A. McLENNAN.

GRAIN ELEVATOR.

No. 371,343. Patented Oct. 11, 1887.

Fig. 1.



WITNESSES:

INVENTOR

BY

ATTORNEY

230–231

(No Model.) 3 Sheets—Sheet 2.

J. A. McLENNAN.

GRAIN ELEVATOR.

No. 371,343. Patented Oct. 11, 1887.

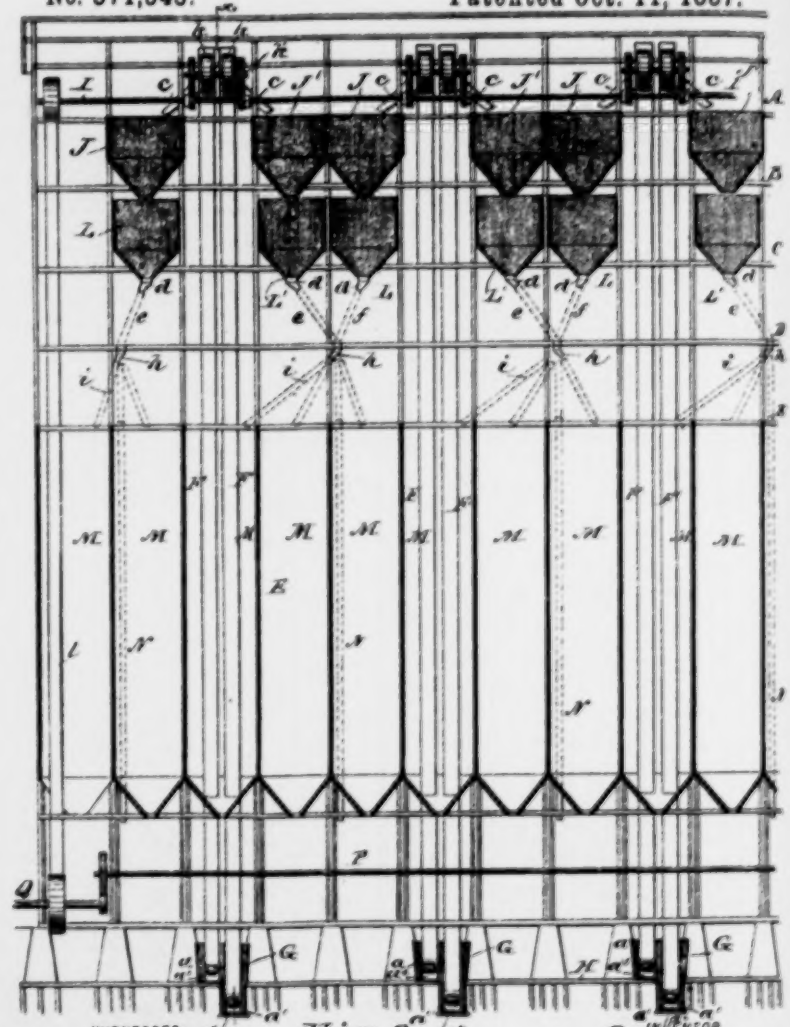


Fig. 2.

WITNESSES:

INVENTOR

Ja. McLennan

BY Munn & Co

ATTORNEY

(No Model.) 3 Sheets—Sheet 3.

J. A. McLENNAN.

GRAIN ELEVATOR.

No. 371,343. Patented Oct. 11, 1887.

Fig. 3.

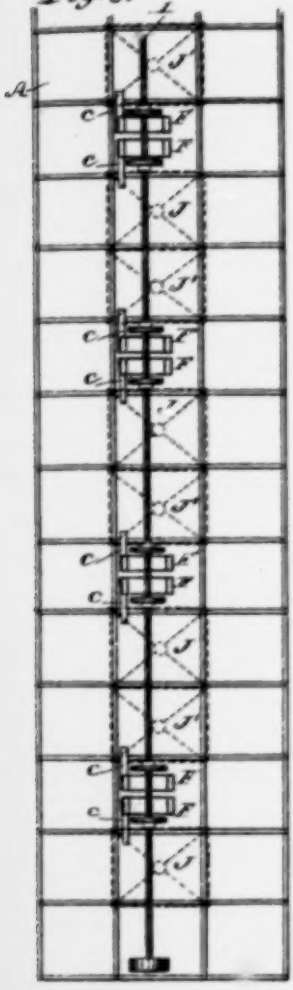
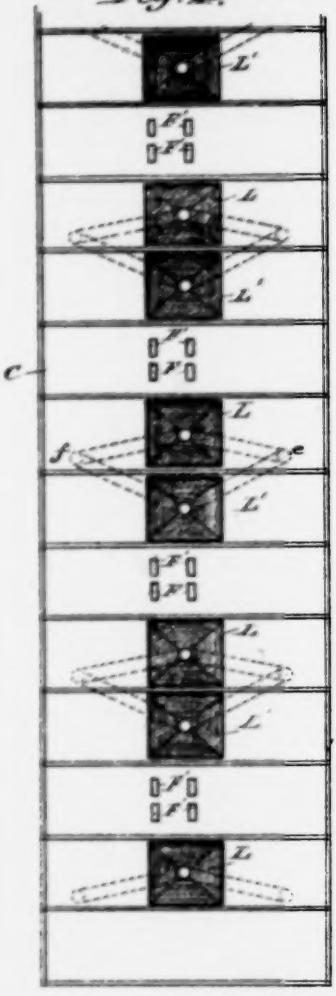


Fig. 4.



WITNESSES:

INVENTOR

BY

ATTORNEY

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233

UNITED STATES PATENT OFFICE.

JOHN A. McLENNAN, OF CHICAGO, ILLINOIS.

GRAIN-ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 371,343, dated October 11, 1887.

Application filed September 27, 1886. Serial No. 214,622. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. McLENNAN, of Chicago, in the county of Cook and State of Illinois, have invented a new and Improved Grain-Elevator, of which the following is a full, clear, and exact description.

My invention relates to certain improvements in the construction and general arrangement of store-houses or elevators for storing, cleaning, or transferring grain and other agricultural products.

Heretofore it has been the practice in constructing large elevator-buildings to place all the receiving-elevators in line, leaving a distance between each elevator nearly the length of a railway-car, and to locate the shipping or transferring elevators in one or more lines parallel to the line of receiving-elevators, but in different tiers of bents of the building. This arrangement necessitates separate lines of shafting on machinery-floor for running the different sets of elevators, causes complications in spouting, and necessitates the employment of different gangs of men if shipping and transferring are done at the same time, and causes much delay and loss of time in the general management of the elevators.

The object of my invention is to overcome these difficulties, to reduce the cost of erecting and equipping such establishments, and to so arrange the elevators that the work of the house may be systematized and facilitated, thus reducing the running expenses.

The invention consists, principally, in locating both the shipping and receiving elevators alternately, with the garners or scales all in one line of bents throughout the building, so that both sets of elevators may be operated from a single line of shafting.

The invention also consists in locating the elevating apparatus in pairs or sets of two lengthwise throughout the building, and in locating the receiving-elevators immediately adjoining and co-operating with the shipping-elevators.

The invention also consists in carrying the lower end of the transfer or shipping elevators to a lower level than the receiving-elevators, and in arranging the receiving boots or hoppers below the railway-tracks at the ground-floor or basement of the house.

The invention finally consists of the construction, arrangement, and combination of parts, all as hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a transverse sectional elevation of the elevator-building, taken on the line *z z* of Fig. 2. Fig. 2 is central longitudinal sectional elevation on the line *y y* of Fig. 1. Fig. 3 is a sectional plan view on line *x x*, Fig. 1, and Fig. 4 is a similar view taken on the line *x' x'* of Fig. 1.

The building has, as shown in the drawings, the outlines of a modern grain-elevator, with a cupola running longitudinally with the body of the building. The cupola is divided into four floors, viz., machinery-floor A, garner-floor B, scale-floor C, and spouting-floor D, which latter is located immediately above the bin-floor E, in the body of the building.

Near the longitudinal center line of the structure are located a series of endless elevators of common construction, placed in pairs of one receiving-elevator, F, and one shipping-elevator, F'. These pairs of elevators each extend below the first or basement floor, H, and are placed, preferably, in the same tank, G, made of suitable material and water-tight. The tanks G are each made of two depths, forming tanks or hoppers *a a'*, for the receiving-elevator F and the shipping-elevator F', and the boots *a' a'* thereof, to obtain the proper incline or angle for transferring from the bins through the spout *b b'*. (Shown in Fig. 1.) The pairs of elevators F F' extend to the machinery-floor A, and are all operated from the same shaft, I, and a spout, *c*, is attached to the head of each elevator to discharge the grain into the receiving-garner J or the transfer or shipping-garner J', as the case may be. These garners J and J' each occupy a separate bent in the building, and are placed in pairs, side by side, along the central longitudinal line of the building, and each pair of garners J J' alternate throughout the length of the building with the pairs of elevators F F', so that every third bent contains a pair of elevators, while the two intervening bents are occupied each by a garner in such manner that the shipping-garner J' is

adjoining and below the shipping-elevator F' and the receiving-garner J adjoining the receiving-elevator F, which system is maintained throughout the cupola.

Below the garners J and J', respectively, are located on the scale-floor C the receiving-hopper scale L and the shipping-hopper scales L', which of course are arranged in pairs and in the same relation with the bents of the building and with the elevators F F' that the garners J J' bear, and by means of the short revolving spouts *d d* the scales may be registered with either of the stationary spouts *e* or *f*. The spouts *e* and *f* are each provided with a second revolving spout, *h*, which is adapted to connect with a spout, *i*, which may be shifted, as shown in dotted lines in Figs. 1 and 2, for directing grain from the scales to the bins M or connected with any of the pipes N for loading the cars O, as indicated in Fig. 1. The lower ends of the bins M may be connected with the transfer or shipping elevators F' by the spouts *b b'*, above referred to, while the shipping-spouts N connect with the car spouts *j* in a common manner. Four lines of cars may receive grain from the spouts N *j*, and the two center lines of cars convey the grain into the elevator, and from which the grain may be transferred by steam-shovels into the boots *a'* of the receiving-elevators F.

The steam-shovels may be operated from a central line of shafting, P. (Shown in Figs. 1 and 2.) The shaft I, which transmits motion to the elevators through the head-pulley *k* on counter-shafts *k'* and by belts or friction-pulleys or chain-wheels or otherwise, is driven from the ground-floor by belt *l*, coming from shaft Q, which transmits motion also to the shaft P. The distance between the pairs of elevators F F' is governed by the length of the railway-cars in use, as there must be the length of one car between each pair in such manner that all the cars in a line may be unloaded simultaneously.

In operation a line of loaded cars is run into the building and stopped so that each car-opening stands opposite to a receiving-elevator, F. The cars are then opened and the steam-shovels started and the grain shoveled from the cars into hoppers and boots *a a'* of the receiving-elevators, which elevators lift the grain to machinery-floor and discharge it into the receiving-garners J, from which it passes to the scales L, weighed, and, by means of the spouts above described, conveyed to the proper bins of the series supplied from that special or particular garner. Meanwhile, the shipping or transferring of grain from another lot of bins may take place through the spouts *b b'*, transferring-elevators F', garners J', scales L', pipes *d h i* and N *j* to any empty cars in the house. In this manner there is no complication of spouting, and both receiving and shipping may be conducted at the same time, and no loss of time or labor in shifting gangs of men, as is unavoidable under the old system, where the receiving-elevators are placed in one line, leaving the distance between each elevator nearly the length of a car, and locating the shipping or transferring elevators in one or more lines parallel to the receiving elevators, but in different lines of bents. The alternate arrangement in the same line of bents of the elevators and the receiving and shipping garners therefore greatly facilitates the management of the house, and besides enables a single line of shafting to be used for the elevators, both receiving and shipping or transferring. Furthermore, by this arrangement both the receiving and shipping elevator boots may be put in the same tank, thereby saving nearly one-half of the present cost of tanks, and the transfer or shipping boot *a'* being on a lower lever, the transfer-spouts *b'* may be passed below the railway-tracks and be stationary and yet out of the way, and the loading of the two elevators together causes only one bent to be obstructed, where by the old system two bents were occupied, and the locality of the elevators in pairs allows them all (both shipping and receiving) to be placed in the center line of the building alternately with the garners and scales, thus enabling the house to be spouted on first floor to the center from both sides to all the "cross-section" bents, while in the old system with two or more lines of elevators, each line only would be reached from the adjoining bents of the house. The shipping and receiving elevators being, as described, arranged in one line and together in pairs, allows one gang of men to attend to the pair of elevators, thus utilizing the time generally lost while one line of cars are being pulled out of the building, which occupies nearly as much time as unloading; and a large saving of time is also accomplished upon the cupola-floors, as the spouting, scale, and weigh men, as well as the machinery men, may do their work in far less time and with considerably less trouble than by the old system, every man attending only to one line of scales or machinery, whereas before he had two or three lines to attend to, and had to effect a passage between them.

It will be understood that although the drawings indicate ordinary bucket belt-elevators, the general system is applicable where any device for elevating the grain is used, and that each of the advantages pointed out may be attained separately by using one part of the system and omitting others.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The grain-elevator comprising two garners, J J', placed side by side, the pair of elevators F F, placed together and contiguous to the garner J', and another pair of elevators F F', placed together and contiguous to the garner J, the said elevators and garners being all arranged in the same line, substantially as shown and described.

2. The grain-elevator comprising a pair of garners, J J', and a pair of scales, L L', ar-

ranged between two pairs of elevators, F F', substantially as described.

3. The grain-elevator comprising two scales, L L', placed side by side, the two pairs of elevators F F', arranged on either side of the scales, the stationary pipe *e*, connected to the scale L', the pipe *f*, connected to the scale L, and the separate pipes *d h*, substantially as described.

4. The grain-elevator comprising two elevators, F F', placed side by side and operated by the same line of shafting, the receiving-boot a^3, the shipping-boot a^4, both placed in and surrounded by a single hopper or tank, G, the boot a^4 being on a lower level than the boot a^3, substantially as and for the purposes set forth.

JOHN A. McLENNAN.

Witnesses:
ROBERT L. TATHAM.
ROBERT JEFFREY.

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(No Model.) 2 Sheets—Sheet 1.

J. MUSGRAVE & J. P. CLARKE.

PORTABLE CHUTE.

No. 426,301. Patented Apr. 22, 1890.

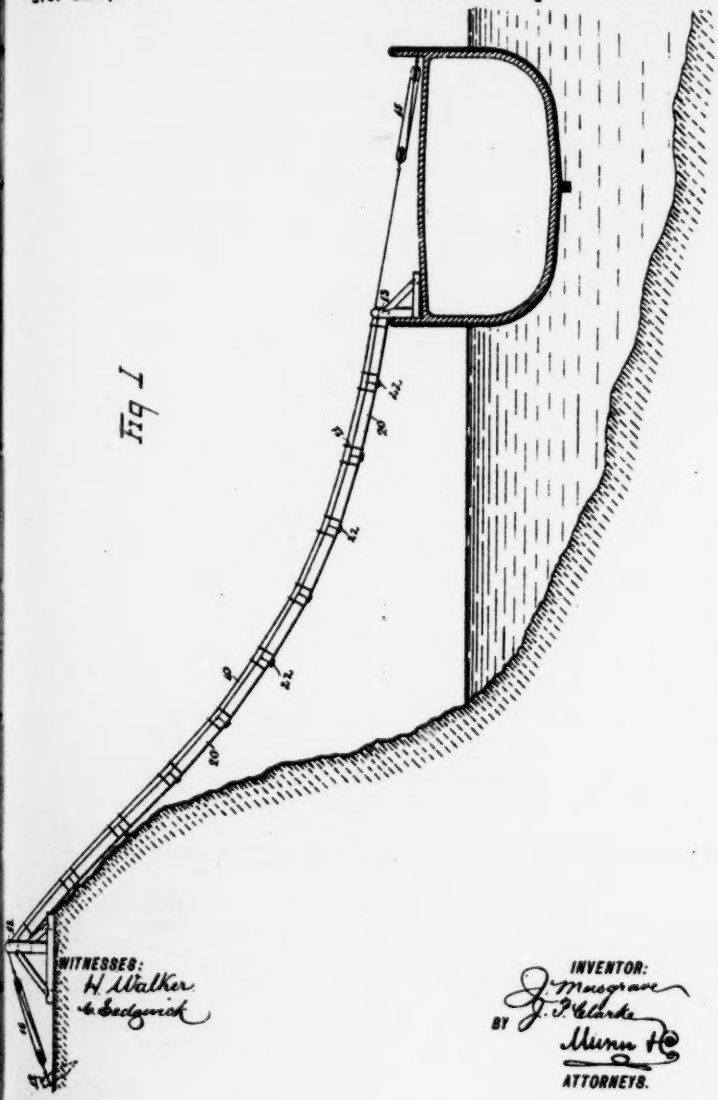


Fig 1

WITNESSES:
H. Walker
A. Sedgwick

INVENTOR:
J. Musgrave
J. P. Clarke
BY Munn & Co
ATTORNEYS.

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(No Model.) 2 Sheets—Sheet 2.

J. MUSGRAVE & J. P. CLARKE.

PORTABLE CHUTE.

No. 426,301. Patented Apr. 22, 1890.

Fig 2

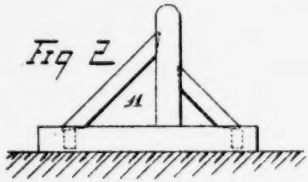


Fig 3

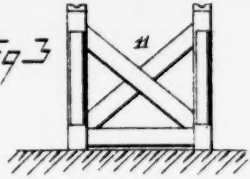


Fig 4

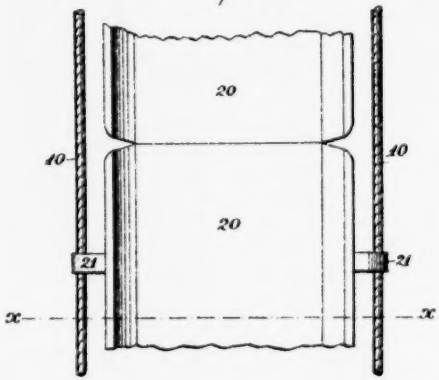


Fig 5

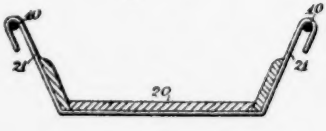
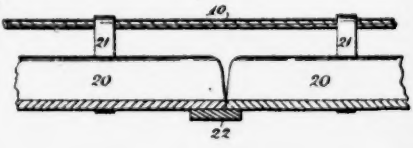


Fig 6



WITNESSES:
H. Walker
C. Bridgwick

INVENTOR:
J. Musgrave
J. P. Clarke
BY Munn & Co
ATTORNEYS.

683
241-243

UNITED STATES PATENT OFFICE.

JAMES MUSGRAVE AND JOSEPH PERCIVAL CLARKE, OF BUENOS AYRES, ARGENTINE REPUBLIC.

PORTABLE CHUTE.

SPECIFICATION forming part of Letters Patent No. 426,301, dated April 22, 1890.

Application filed September 18, 1889. Serial No. 324,298. (No model.) Patented in the Argentine Republic May 9, 1887, No. 586.

To all whom it may concern:

Be it known that we, JAMES MUSGRAVE and JOSEPH PERCIVAL CLARKE, both of Buenos Ayres, in the Argentine Republic, South America, have invented a new and Improved Portable Chute, of which the following is a full, clear, and exact description.

This invention relates to portable chutes, the object of the invention being to provide a chute which may be moved from place to place, and which when in use may be adjusted within certain limits to any desired pitch.

To the ends named the invention consists in the construction and arrangement of parts, all as will be hereinafter fully explained, and specifically pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the views.

Figure 1 is a side view of our improved portable chute, the same being represented as it appears when arranged in connection with a vessel that is to be loaded from the shore. Fig. 2 is a side view of the abutment employed in connection with the chute. Fig. 3 is an edge view of the abutment. Fig. 4 is a plan view of a portion of the chute. Fig. 5 is a cross-sectional view taken on line *x x* of Fig. 4; and Fig. 6 is a central longitudinal sectional view of a portion of the chute.

In constructing a chute such as the one forming the subject-matter of this application we provide supporting-cables 10, which are passed over any proper abutment—such as the one shown at 11—and connected to an anchorge 12, the cables being led downward to the vessel, there passing over an abutment, as 13, to be secured to any proper point upon the vessel's deck. In practice we prefer to connect tackles 15 to each end of the cables; but any proper means for adjusting the tension of the cables might be employed. The chute proper is made up of a series of troughs 20, which said troughs are provided with suspending-irons 21, the ends of said irons being bent to overlap the cables 10. The lower end of each chute section is provided with a transverse strip 22, upon which the upper end of the next section below rests.

From the construction above described it will be seen that we secure an exceedingly flexible chute, and one which may be easily moved from place to place. It will also be seen that the pitch of the chute may to a certain extent be regulated by varying the tension of the cables.

This chute may be adjusted so as to deliver the material with which the vessel is to be loaded to any one of the hatches, and that, too, without moving the vessel from its anchorage.

In certain cases the chute-sections might be suspended from a single cable, or if more than two cables were required additional cables might be employed without departing from the spirit of our invention, the essential feature of which is a flexible support and a series of chute-sections upheld thereby.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

The combination, with cables 10, of chute-sections 20, provided with transverse strips 22, and with hooked irons 21, said irons being arranged to engage the cables, substantially as described.

JAMES MUSGRAVE.
JOSEPH PERCIVAL CLARKE.

Witnesses to the signature of Jas. Musgrave:
W. S. MARTIN,
A. A. DUNCAN.
Witnesses to the signature of J. P. Clarke:
J. B. DAVIS,
WOODBINE PARISH.

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244-245

(No Model.) 2 Sheets—Sheet 1.

J. SIMPSON.

GRAIN SPOUT.

No. 445,645. Patented Feb. 3, 1891.

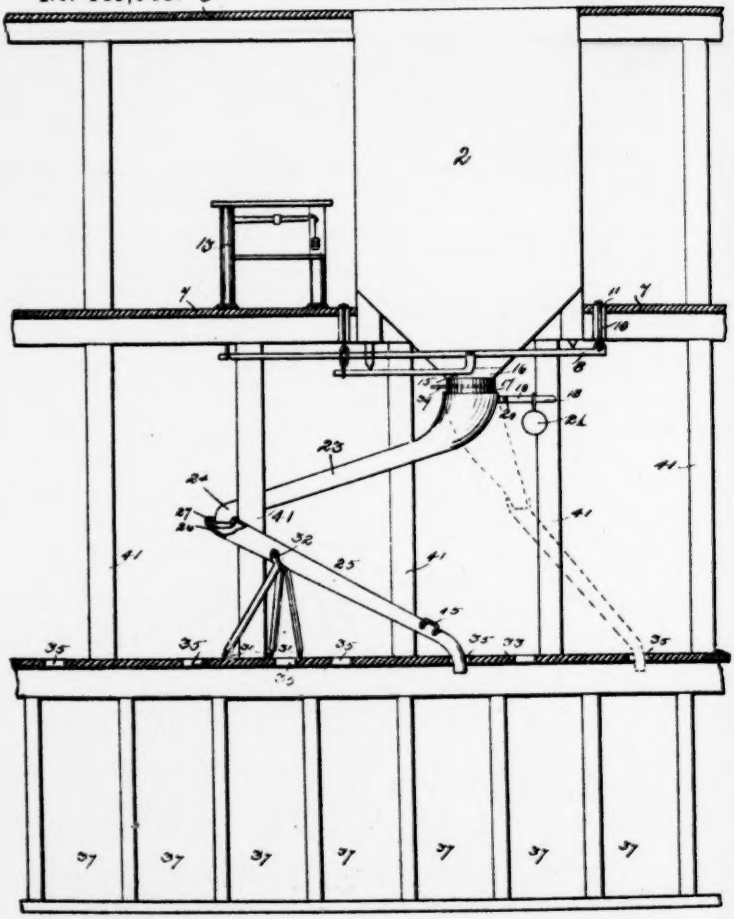


Fig. 1.

Witnesses.
O. E. Van Doren.
C. L. Hawley.

Inventor.
John Simpson
By Paul Mennin Attys.

(No Model.) 2 Sheets—Sheet 2.

J. SIMPSON.

GRAIN SPOUT.

No. 445,645. Patented Feb. 3, 1891.

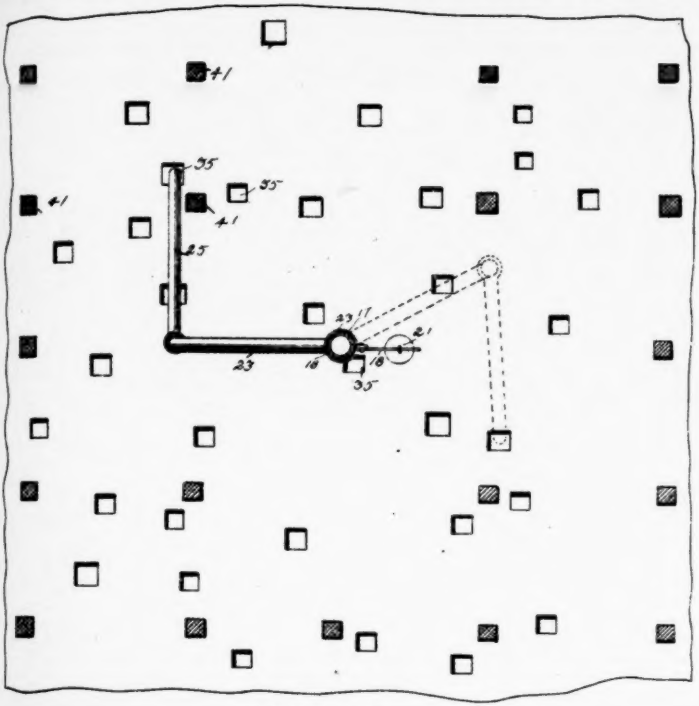


Fig. 2.

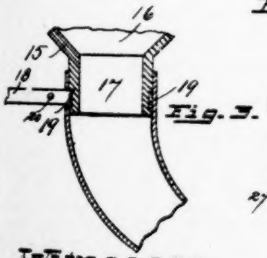


Fig. 3.



Fig. 5.

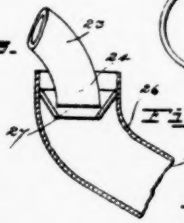


Fig. 4.

Witnesses
B. E. Van Dorens.
O. L. Hawley.

Inventor
John Simpson
By Paul & Brown Attys

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247

UNITED STATES PATENT OFFICE.

JOHN SIMPSON, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF ONE-HALF TO DIGHTON A. ROBINSON, OF SAME PLACE.

GRAIN-SPOUT.

SPECIFICATION forming part of Letters Patent No. 445,645, dated February 3, 1891.

Application filed February 15, 1890. Serial No. 340,655. (No model.)

To all whom it may concern:

Be it known that I, JOHN SIMPSON, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain Improvements in Grain-Spouts, of which the following is a specification.

My invention relates to means for spouting or removing by gravity grain from one receptacle to another, and is particularly adaptable and useful in elevators for spouting grain from the scale-hopper to the various bins in the elevator; and the invention consists, generally, in two spouts or chutes, preferably made of metal, the upper one pivotally supported upon the bottom of the scale-hopper and adapted to be rotated about said hopper, and the lower one supported upon a suitable frame provided with rollers, so that it may be easily moved about the floor. The lower end of the upper spout is adapted to fit into the upper end of the lower spout, which may be rotated about said upper spout, thereby making a continuous conductor to any part of the floor within a circle described by the combined lengths of the two spouts. For convenience in weighing grain the upper spout is provided with a counterbalancing-weight to raise the upper from the lower spout, except when the grain is passing through it, all of which is hereinafter more fully described, and particularly pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a vertical section of a portion of an elevator provided with my improvements. Fig. 2 is a sectional view on line *x x* of Fig. 1. Fig. 3 is a detail showing the manner of connecting the upper spout to the hopper. Fig. 4 is a detail showing manner of constructing the parts of the two spouts where they come together. Fig. 5 is a detail plan view of the counterbalancing-weight and ring.

In the drawings, 2 represents a scale-hopper extending from the garner-floor 5 to the scale-floor 7 and supported upon suitable weighing-levers 8 and 9, supported by the bolts 10 upon the floor-timbers 11 and connected with the scales 13. Upon the bottom of the hopper is secured a suitable casting 15, having preferably the upper part 16 constructed flaring to fit onto the bottom of the hopper, and the lower part 17 cylindrical and provided with the annular groove 19. A bar of iron 18 is preferably provided bent in the form of a ring, so as to fit into the groove 19, and secured in place by means of the bolt 20, one end projecting out far enough to receive the weight 21. To the bar 18 is securely riveted the upper spout 23, so that when the band 18 is in place in the groove 19 it supports the spout 23. A lower spout 25 is provided, the upper end 26 of which is preferably made flaring or enlarged to receive the end 24 of the spout 23.

Arranged to fit in the enlarged end 26 of the spout 25 is a seat 27, preferably secured to the inclosing spout, the lower end being contracted so that its diameter is less than the diameter of the end 24 of the spout 23, thereby forming a seat for the spout 23 when in use. The spout 25 is preferably pivotally mounted upon a suitable track or frame 30, supported upon rollers 31, by means of the pivot 32, to facilitate its being moved from one place to another on the floor 33, which is provided with openings 35, leading into the bins 37 for the reception of the grain.

On the projecting end of the bar 18 is adjustably secured the weight 21, so as to counterbalance the weight of the spout 23, lifting the end 24 from contact with its seat 27 in the spout 25, so that it normally hangs suspended from the scale-hopper 2, the scales being adjusted to balance the weight of the hopper and the suspended spout.

A slide 39 is arranged in the casting 15 for opening and closing the outlet from the hopper into the spouts.

In operating the device, the grain being elevated into hopper 2 and weighed by the scales 13, the slide 39 is withdrawn, when the grain rushes into spout 23, its gravity overcoming the weight 21, thereby pressing the end 24 of the spout 23 firmly against the seat 27 in the enlarged end of the spout 25, the other end of the spout 25 being inserted in the opening 35, leading into the bin 37, into which it is desired to conduct the grain. When the grain is all out of the hopper 2, the spout 23 is automatically raised from contact with its seat 27 by means of the weight 21, but not out

of the spout 25. The spout 23 is adapted to be rotated about the bottom of the hopper 2 upon the bar 18, secured in the annular groove 19. The area traversed by the spout 23 when rotated should be free from posts or supporting-timbers 41; but outside this circle supporting-timbers may be placed when desired, as the construction and arrangement of the two spouts permit their being used in openings which may be directly behind the posts 41, as shown in Fig. 2. The dotted lines in both Figs. 1 and 2 show different positions into which the spouts may be swung. The end 24 of the spout 23 being rotated upon the inner casting in the spout 25, the dust from the grain is prevented from escaping from the spouts into the room, thereby avoiding a common nuisance and great annoyance.

A suitable handle 45 is secured to the spout 25, to take hold of in moving the spout from place to place.

I claim as my invention—

1. A grain-conductor comprising, in combination, an upper spout rotatively secured to a suitable support, an independent lower spout adapted to receive the loose end of the upper spout in any position in which it may be and capable of being rotated about said upper spout as a center, and an independent support mounted upon suitable rolls and supporting said lower spout, substantially as described.

2. The combination, with a scale-hopper, of a counterbalanced rotative spout 23, secured thereto.

3. The combination, with a scale-hopper for weighing grain, of a grain-conductor comprising two spouts, one secured to and adapted to rotate about said scale-hopper, the other adapted to receive the loose end of said first spout and to be rotated about it, and a counterbalancing-weight adapted to hold said first spout out of contact with said second spout when in its normal position, for the purpose specified.

4. The combination, with the scale-hopper, of a counterbalanced rotative spout 23, secured thereto, the independent movable spout 25, adapted to receive the loose end of the spout 23 in any position in which it may be, and a supporting-frame 30, provided with suitable rollers 32, substantially as described.

5. The combination, with the hopper 2, of the casting 15, secured thereto, provided with the annular groove 19, bar 18, secured in said groove and provided with weight 21, and the spout 23, secured to said bar, for the purpose specified.

6. The combination, with the spout 23, of the independent movable spout 25, having its upper end enlarged and adapted to receive the spout 23 in any position, the seat 27, secured to the said spout 25, the lower end of said seat being of less diameter than the end of the spout 23, for the purpose specified.

7. The combination, with a scale-hopper, of the casting 15, secured thereto, provided with the annular groove 19, bar 18, carrying weight 21, counterbalanced suspended spout 23, secured to said bar and adapted to rotate in said annular groove, and the spout 25, adapted to receive the loose end of the spout 23, substantially as described, and for the purpose specified.

8. The combination, with the hopper 2, of the casting 15, having groove 19, bar 18, weight 21, spouts 23 and 25, and seat 27, substantially as described, and for the purpose specified.

In testimony whereof I have hereunto set my hand this 3d day of February, 1890.

JOHN SIMPSON.

In presence of—
S. W. ROBERTS,
A. M. GASKILL.

(No Model.) 3 Sheets—Sheet 1.

E. D. MAYO.

DOUBLE SWIVEL GRAIN DISTRIBUTING SPOUT.

No. 464,101. Patented Dec. 1, 1891.

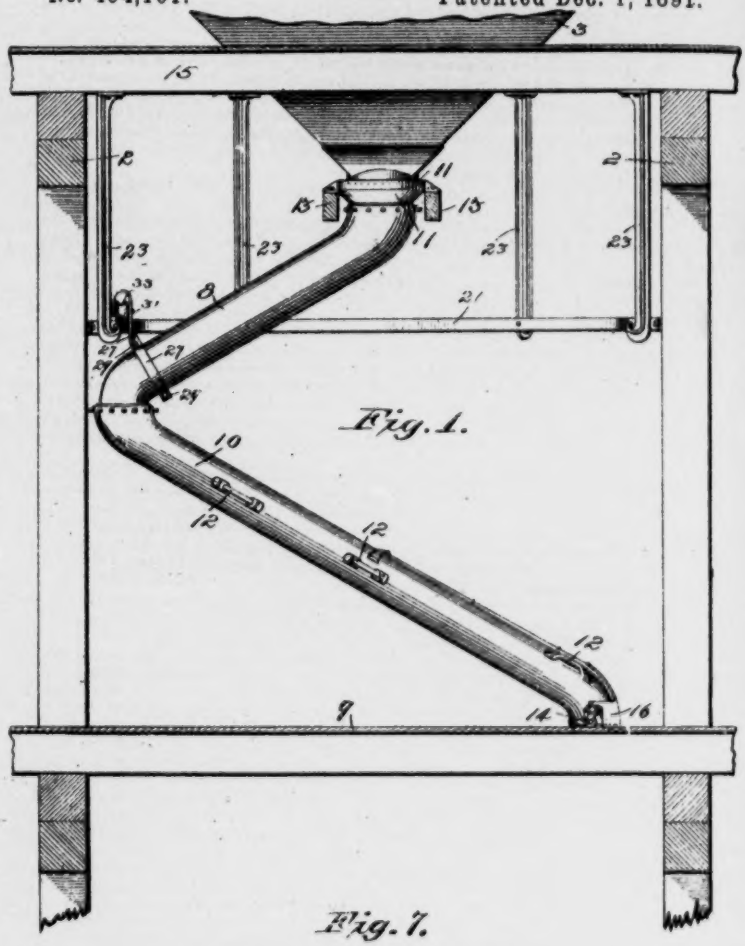


Fig. 1.

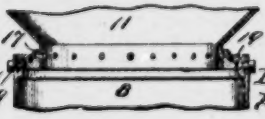


Fig. 7.

Witnesses,
C. E. Van Dorn,
T. J. Fyon.

Inventor,
Edward D. Mayo,
By Paul Synnestvedt
Attorney

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(No Model.) 3 Sheets—Sheet 2.

E. D. MAYO.

DOUBLE SWIVEL GRAIN DISTRIBUTING SPOUT.

No. 464,101. Patented Dec. 1, 1891.

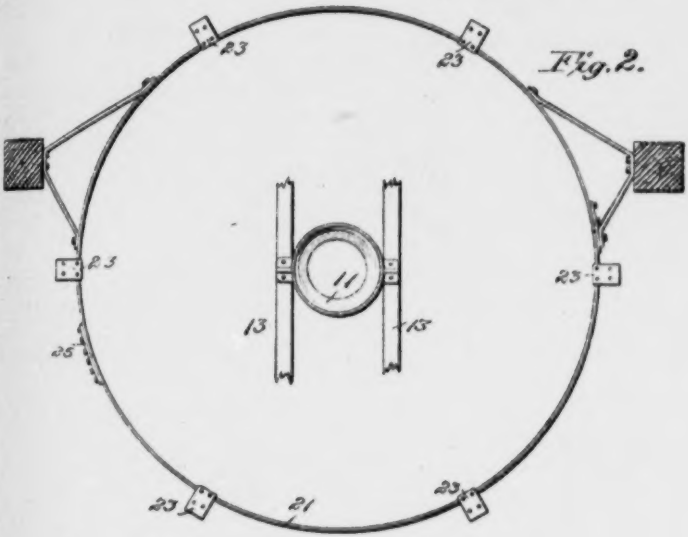


Fig. 2.

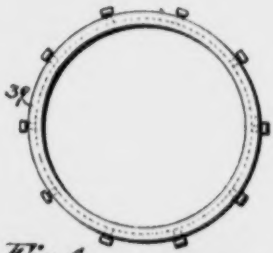
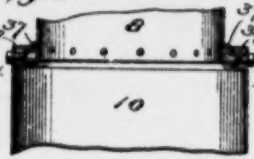


Fig. 3.

Fig. 4.



Witnesses.
C. E. Van Doren
F. A. Lyon.

Inventor,
Edward D. Mayo
By Paul & Merwin
Attorneys

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(No Model.) 3 Sheets—Sheet 3.

E. D. MAYO.

DOUBLE SWIVEL GRAIN DISTRIBUTING SPOUT.

No. 464,101. Patented Dec. 1, 1891.

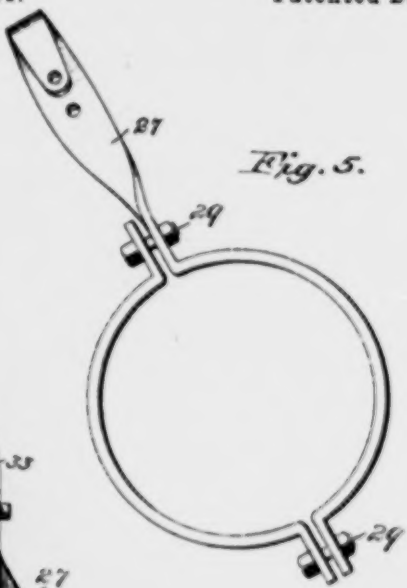


Fig. 5.

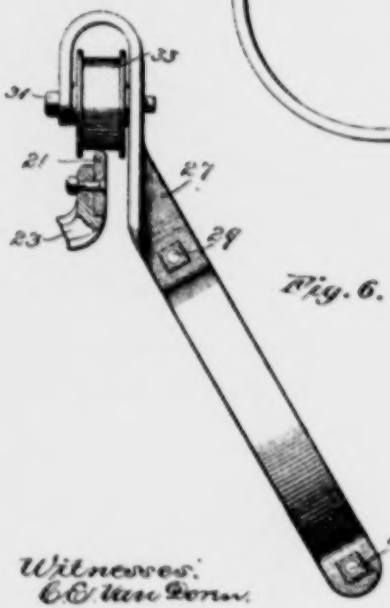


Fig. 6.

Witnesses:
C. C. Van Dorn.
F. J. Lyon

Inventor,
Edward D. Mayo,
By Paul & Brown Attys.

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UNITED STATES PATENT OFFICE.

EDWARD D. MAYO, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO BARNETT & RECORD, OF SAME PLACE.

DOUBLE-SWIVEL GRAIN-DISTRIBUTING SPOUT.

SPECIFICATION forming part of Letters Patent No. 464,101, dated December 1, 1891.

Application filed August 15, 1891. Serial No. 402,755. (No model.)

To all whom it may concern:

Be it known that I, EDWARD D. MAYO, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Double Swivel Grain-Distributing Spouts, of which the following is a specification.

This invention relates to improvements in grain-distributing spouts designed especially for use in grain-elevators; and the invention is particularly applicable for use in connection with a scale-hopper, and it is adapted to conduct the grain from the scale-hopper to any one of a series of grain-bins.

The invention consists, generally, in the construction and combination hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a transverse vertical section of the spout-supporting device, with an elevation of a spout constructed in accordance with my invention. Fig. 2 is a plan view of the circular supporting-track. Figs. 3 and 4 are details of the lower spout-support, showing the manner of securing the lower spout to the upper. Figs. 5 and 6 are details of the clamp that is connected to the lower end of the upper spout-section, and showing the supporting-roller arranged thereon. Fig. 7 is a detail of the upper spout-support.

In the drawings, 2 2 represent the timbers or beams forming a portion of the elevator and providing means for supporting my improved spout.

3 represents the scale-hopper, which is of ordinary construction and supported in the usual way. Arranged below this hopper is the double distributing-spout, which is adapted to receive the grain from the scale-hopper and conduct it to any one of a series of openings in the floor 9. Below the scale-hopper is a ring or head 11, that is of circular form, and through which the grain passes as it leaves the hopper. This ring is arranged immediately below the hopper and is secured upon the horizontal beams or strips 13, that are in turn supported from the main beams 15, from which the circular track, hereinafter referred to, is supported, so that any settling or change of position of the beams 15 will cause an equal change of position of both ends of the upper spout-section, so as not to interfere with the free working of the spouts. The head or ring 11 is provided with a horizontal flange 17, and the upper spout-section 8 is provided with a horizontal flange 19, that overlaps and lies upon said flange 17. The flange 19 forms a support for the upper end of the spout-section 8, and this flange is adapted to turn freely upon the flange 17 of the ring 11, and it may also rise off from the flange 17 should such movement be necessary in the free operation of the spout. A circular track 21 is supported by hangers 23 from the beams 15, this track being concentric with the ring 11 and the upper end of the spout-section 8, but being arranged at a considerable distance below said ring 11. The ends of the track are secured together by means of a plate 25, whose upper edge is below the upper edge of the track, so as not to interfere with the movement of the wheel or truck, as hereinafter described. The hangers 23 are connected to the track 21 by having their lower ends upturned, as shown in Fig. 1, and bolted or riveted to the track 21, so as to leave the upper edge of the tracks projecting above said upturned end of the hanger. A clamp 27, consisting of two half-rings having the ends secured together by bolts 29, are arranged to clasp the lower end of the spout-section 8, and one of said rings is extended upward and then curved down and forms a bearing for the axle-pin 31 of the wheel or truck 33. This wheel 33 rests upon the track 21, and thereby supports the lower end of the spout-section 8, as shown in Fig. 1. This wheel is of greater width than the track 21, and as the flange 19 fits loosely upon the flange 17 of the ring 11 the spout-section 8 is capable of considerable lateral movement upon its supports, so as to allow for irregular portions of the track. The lower end of the upper spout-section is provided with an outwardly-projecting horizontal flange 37, corresponding to the horizontal flange upon the ring 11, and the upper end of the lower spout-section is provided with an inwardly-projecting horizontal flange 39, corresponding to the horizontal flange 19 at the upper spout-section. The lower spout-section 10 is preferably

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provided with one or more handles 12, by means of which both of said spouts may be moved to any desired position. The lower end of the lower spout-section 10 is preferably provided with the supporting rolls or casters 14, that are secured to said spout, and are adapted to rest upon the floor and support the lower end of said spout-section while it is being moved from one position to another. The lower end of the section 10 is preferably curved downward and provided with the pivoted hood 16, which is adapted to drop down a short distance into an opening in the floor, as indicated by dotted lines in Fig. 1, and thereby preventing any of the grain from running out under the end of the spout. It will be seen that both of the spouts have a swinging movement upon the rings or flanges that support their upper ends. The upper sections may be turned upon the ring 11, and may also be given a slightly lateral movement. By swinging the upper spout-section its lower end is carried around, being supported upon the track 21, and thereby the upper end of the lower spout-section is carried with it. Then the lower spout-section may be turned about the lower end of the upper spout-section, and thereby the spout may be arranged to distribute the grain to any point within a large radius.

I claim as my invention—

1. The combination, with the supporting-ring 11, provided with a horizontal flange 17, of the upper spout-section 8, provided with a horizontal flange resting upon said flange 17, the horizontal flange 37 upon the lower end of said spout-section, and the lower spout-section 10, provided with the horizontal flange 39 at its upper end, resting upon the flange 37 upon said upper spout-section, whereby each of said spout-sections is capable of a rotative and a lateral movement upon its support.

2. The combination, with the ring 11, secured upon a stationary support, of a spout-section having its upper end rotatively secured upon said ring, a circular track concentric with said ring, a wheel or truck provided with a clamp that is secured to the lower end of said spout-section and rests upon said ring, and the lower spout-section having its upper end rotatably secured to the lower end of said first-named section, substantially as described.

3. The combination, with the beams 13, of the beams 13, supported therefrom, the ring 11, secured upon said beams 13, the hangers 23, secured upon the beams 13, the circular track 21, supported upon said hanger, and the inclined spout having its upper end rotatably secured upon said ring 11 and its lower end provided with a truck resting upon said track 21, and the lower spout-section having its upper end rotatably secured to the lower end of said first-named section, substantially as described.

4. The combination, with a suitable supporting-ring, of a spout-section having its upper end rotatably secured to said ring and its lower end suspended upon a track that is concentric with said ring, substantially as described.

In testimony whereof I have hereunto set my hand this 5th day of August, 1891.

EDWARD D. MAYO.

In presence of—
F. S. LYON,
C. E. VAN DOREN.

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(No Model.) 2 Sheets—Sheet 1.

D. A. ROBINSON.

SWIVEL SPOUT FOR ELEVATORS.

No. 524,984. Patented Aug. 21, 1894.

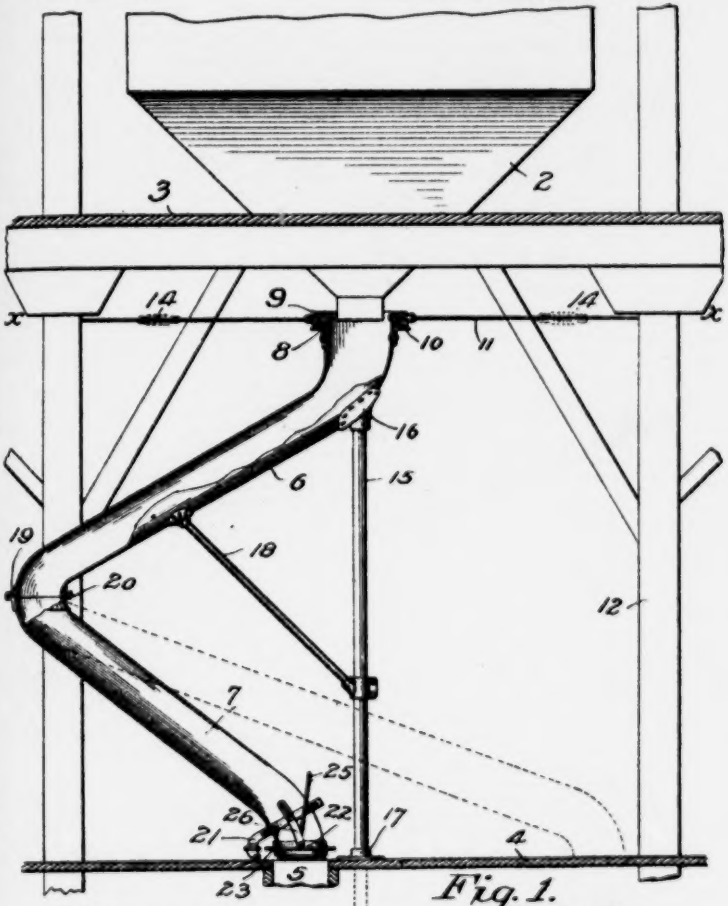


Fig. 1.

Witnesses.
Chas. E. Van Dorn.
F. S. Lyon

Inventor,
Dighton A. Robinson.
By Paul & Hawley
his Attorneys.

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(No Model.) 2 Sheets—Sheet 2.

D. A. ROBINSON.

SWIVEL SPOUT FOR ELEVATORS.

No. 524,984. Patented Aug. 21, 1894.

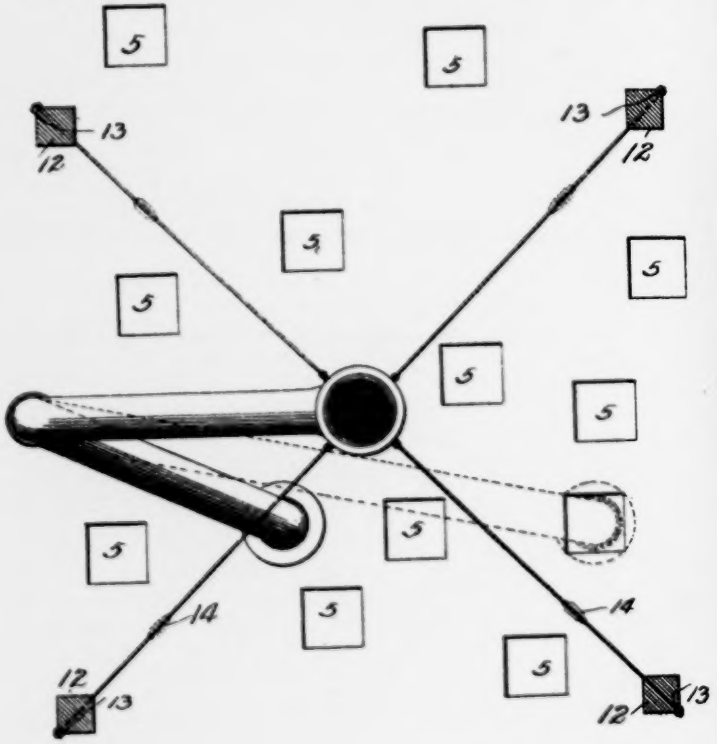


Fig. 2.

Witnesses.
Chas. E. Van Dorn,
W. B. Hyde.

Inventor,
Dighton A. Robinson.
By Paul & Hawley.
his Attorneys.

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UNITED STATES PATENT OFFICE.

DIGHTON A. ROBINSON, OF MINNEAPOLIS, MINNESOTA.

SWIVEL-SPOUT FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 524,994, dated August 21, 1894.

Application filed October 30, 1893. Serial No. 489,548. (No model.)

To all whom it may concern:

Be it known that I, DIGHTON A. ROBINSON, of the city of Minneapolis, county of Hennepin, State of Minnesota, have invented certain new and useful Improvements in Swivel-Spouts for Elevators, of which the following is a specification.

This invention relates to swivel spouts for grain elevators, and particularly to spouts adapted for use between the weighing hoppers or garners of the upper floors and the storage bins beneath.

The particular object which I have in view is to provide improvements upon the spout shown and described in the patent to John Simpson, issued February 3, 1891, No. 445,645; and further, a spout which shall be considerably cheaper both to manufacture and to place in position and which will be more distinctly portable.

To this end my invention consists in the combination with an upper inclined section with a lower section swiveled thereon, and a central mast or shaft stepped upon the floor and supporting the upper section of the spout.

My invention consists further in the various constructions and combinations hereinafter described and particularly pointed out in the claims.

The invention will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a vertical elevation of a spout embodying my invention, portions thereof being broken away to more clearly show its construction. Fig. 2 is a sectional plan view on the line x—x of Fig. 1.

As shown in the drawings, 2 represents a garner bin or weighing hopper, the lower end of which extends down through the floor 3, between which floor and the lower floor 4 provision is made for distributing the grain or other material from the hopper 2 to the several bins underlying the floor 4 and into which suitable spouts, extending from the floor holes 5, extend. The holes in the floor are arranged irregularly and it is therefore necessary that the distributing spouts have perfect freedom of movement in all their actions. The distributing spout is preferably made in two inclined sections 6 and 7. The upper section 6 is somewhat enlarged at the top to surround the lower end of the hopper 2 and carries the flanged ring 8. The upper end of the spout is held concentric of the hopper by a suitable ring 9 which is slipped down over the end of the ring 8 and rests upon the flange 10 thereof. The retaining ring or, as it may be termed, journal is itself held by any suitable means, such as the guy-rods or wires 11 which are adjustably secured in the posts or frame work 12. The ring is made adjustable laterally by means of nuts 13 on the outer ends of the guy-rods or by means of turn-buckles 14, as shown in dotted lines, and by the use of which the ring may be moved in any direction to compensate for settling of the building or change of construction. The ring, it will be seen, in no way aids in the support of the spout which is alone supported by a central mast or shaft 15, secured in the angle casting 16 on the bottom of the spout and concentric with the upper end thereof, while the lower end of the shaft is journaled in the step or block 17 provided on the floor. The brace 18 extending from the shaft to a lower point on the spout, holds the same at the proper angle. At the lower end of the part 6 I provide the flanged ring 19 which, through the channeled or grooved ring 20 secured upon the upper end of the lower part, supports the lower part of the spout. At the floor line the end of the distributing spout is supported upon the fixed cast 21, which permits the easy movement of the spout from one position to another.

To close the opening between the end of the spout and around the hole in the floor I employ the ring or collar 22, having the wide flange 23 and arranged to be dropped to the floor. For raising the ring I provide a ball 25, and to hold the ring in place upon the end of the spout I ordinarily provide curved links 26 having the slotted upper ends retained on pins in the sides of the spout. The lower section of the spout is preferably short enough to pass by the supporting mast, but if the floor holes are widely separated the longer section may be employed, as indicated by dotted lines in Fig. 1.

By simply providing a long bearing or a double bearing for the lower end of the shaft or mast it may be given sufficient rigidity to

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render the use of the retaining or journal ring 9 unnecessary. Such a double bearing is shown by dotted lines in Fig. 1.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with the inclined upper part of the spout, of a central vertical mast or shaft whereon the same is supported from beneath, and the lower inclined part of said spout having its upper end swiveled in the lower ends of said upper part, and a brace extending between said shaft and the upper part of the spout, to support the same and therewith the lower part of the spout, all as and for the purpose specified.

2. The combination, with the upper inclined part of the spout, of the lower part also inclined and swiveled thereon, a central mast or shaft supporting said upper part from beneath, and a stationary ring wherein the upper end of the spout is held against lateral movement, substantially as described.

3. The combination, with the upper inclined part of the spout, of the lower part also inclined and swiveled thereon, a central mast or shaft supporting said upper part from beneath, a stationary ring wherein the upper end of the spout is held against lateral movement, and guys extending from said ring to suitable fastenings, substantially as described.

In testimony whereof I have hereunto set my hand this 25th day of September, 1893.

DIGHTON A. ROBINSON.

In presence of—
F. S. LYON,
M. E. GOOLEY.

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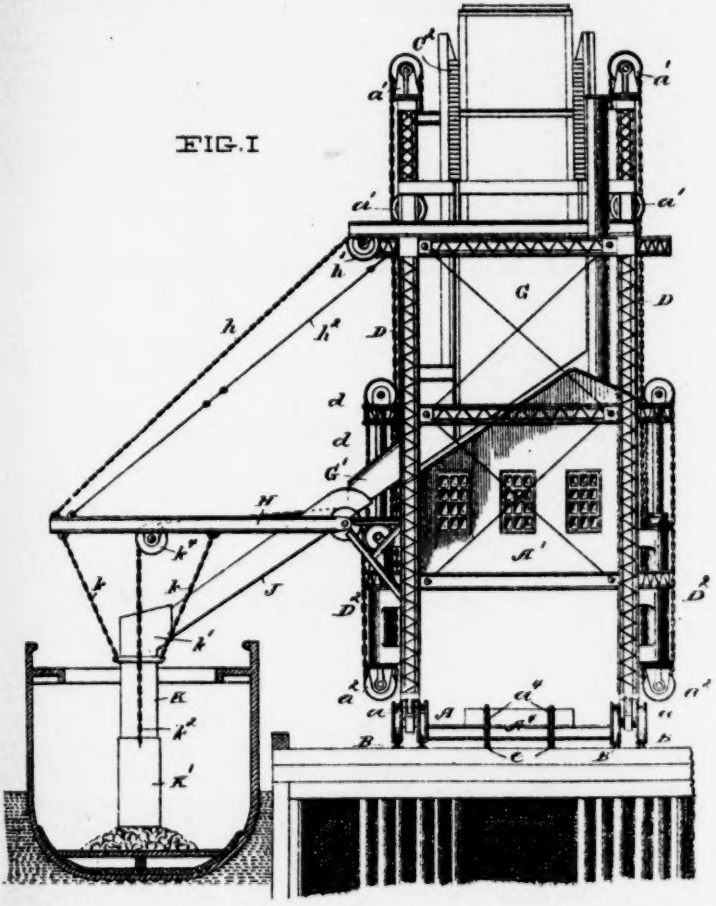
(No Model.) 5 Sheets—Sheet 1.

P. RASCH.

APPARATUS FOR HOISTING AND UNLOADING RAILWAY CARS.

No. 556,371. Patented Mar. 17, 1896.

FIG. I



WITNESSES,

J. C. Turner

W. Fischer

INVENTOR,

Peter Rasch

By Hall & Fay

Atty's.

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266–267

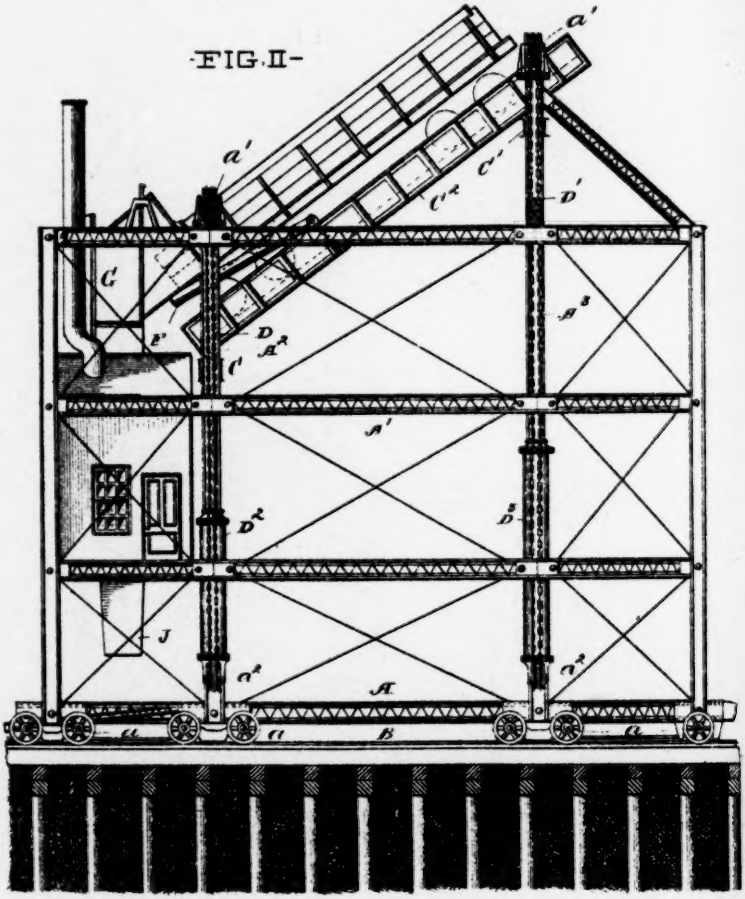
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P. RASCH.

APPARATUS FOR HOISTING AND UNLOADING RAILWAY CARS.

No. 556,371. Patented Mar. 17, 1896.

FIG. II.



WITNESSES,
J. C. Turner
Wm. Lecher

INVENTOR,
Peter Rasch
By Hall & Fay
Attys.

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268-269

(No Model.) 5 Sheets—Sheet 3.

P. RASCH.

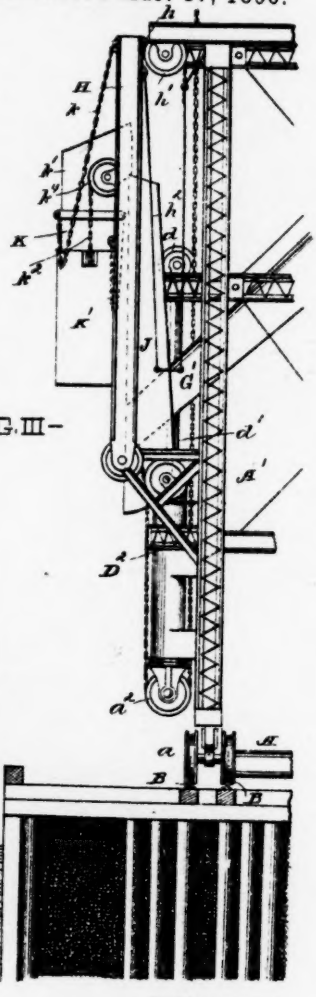
APPARATUS FOR HOISTING AND UNLOADING RAILWAY CARS.

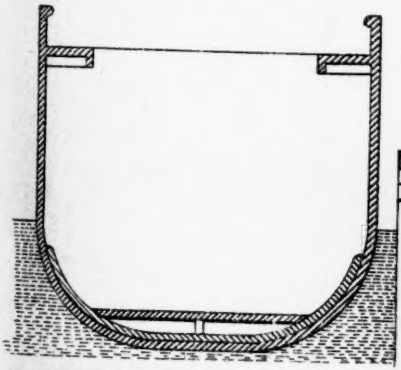
No. 556,371. Patented Mar. 17, 1896.

-FIG. IV-



-FIG. III-





WITNESSES,
H. C. Turner
Wm. Jecker

INVENTOR,
Peter Rasch
By Hall & Fay
Attys.

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(No Model.) 5 Sheets—Sheet 4.

P. RASCH.

APPARATUS FOR HOISTING AND UNLOADING RAILWAY CARS.

No. 556,371. Patented Mar. 17, 1896.

FIG. X.

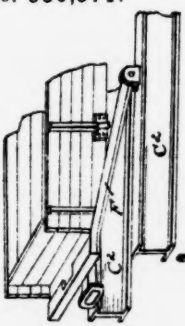


FIG. VI

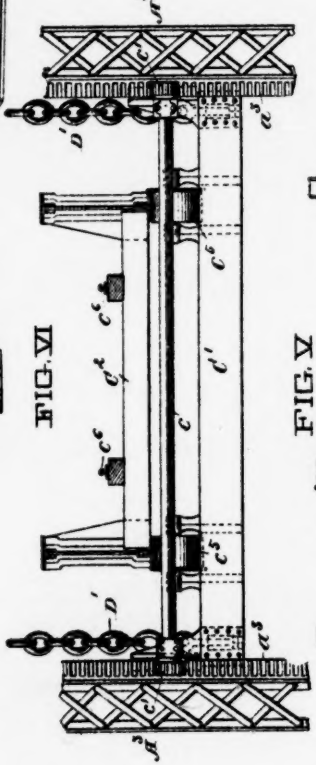


FIG. V

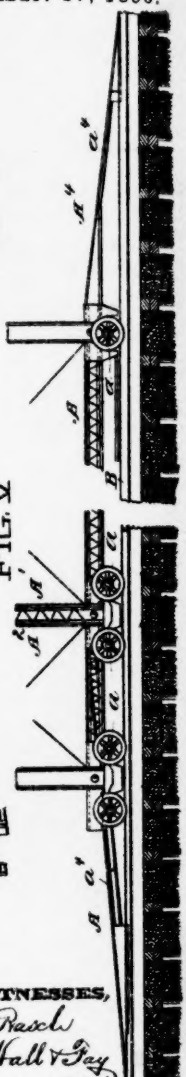
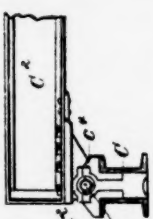


FIG. VII



WITNESSES,
J. C. Turner
Wm. Secker

WITNESSES,
Peter Rasch
By Hall & Fay
Atty's.

701
272

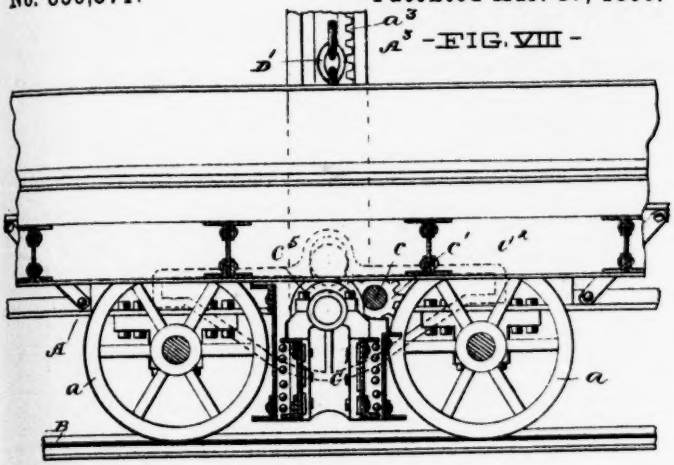
(No Model.) 5 Sheets—Sheet 5.

P. RASCH.

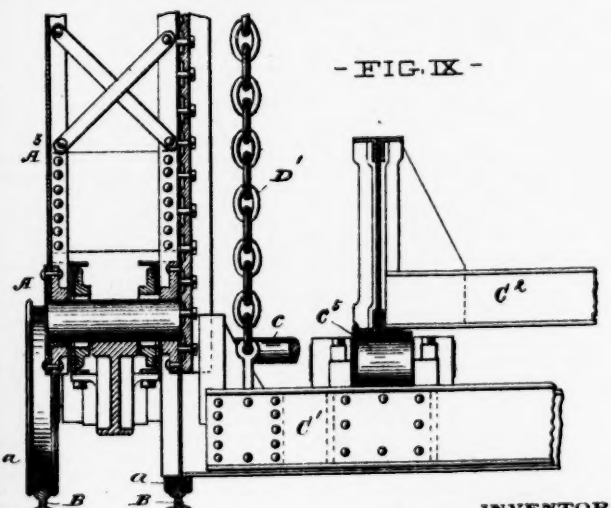
APPARATUS FOR HOISTING AND UNLOADING RAILWAY CARS.

No. 556,371. Patented Mar. 17, 1896.

- FIG. VIII -



- FIG. IX -



WITNESSES:
J. C. Turner
Wm. F. Lechner

INVENTOR.
Peter Rasch
By Hall & Fay
Attys.

702

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UNITED STATES PATENT OFFICE.

PETER RASCH, OF CLEVELAND, OHIO.

APPARATUS FOR HOISTING AND UNLOADING RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 556,371, dated March 17, 1896.

Application filed February 8, 1895. Serial No. 537,696. (No model.)

To all whom it may concern:

Be it known that I, PETER RASCH, a subject of the King of Denmark, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Apparatus for Hoisting and Unloading Railway-Cars, of which the following is a specification, the principle of the invention being herein explained, and the best mode in which I have contemplated applying that principle so as to distinguish it from other inventions.

The annexed drawings and the following description set forth in detail one mechanical form embodying the invention, such detail construction being but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings, Figure I represents an end elevation of my improved apparatus for hoisting and unloading railway-cars, showing the apparatus in position at the edge of a wharf with a vessel loading at the wharf; Fig. II, a side elevation of the apparatus; Fig. III, an end elevation of as much of the apparatus as will illustrate the raised position of the chute and its jib; Fig. IV, a front view of the telescoping tubular portion of the chute; Fig. V, a side elevation of so much of the wheeled base of the apparatus as will illustrate the inclined approaches; Fig. VI, a detail view of the mechanism for guiding each end of the elevator-platform and of the mechanism for permitting longitudinal movement at one end of such platform; Fig. VII, a detail view of the hinge-support for the other end of the platform; Fig. VIII, an enlarged detail view of a portion of the platform, its rolling support, and of one transverse beam; Fig. IX, a transverse section of the same parts, said two latter figures showing the platform in its lowermost position; and Fig. X, a perspective view of the end of a car, illustrating the application of a hinged stop for the same.

The base A of an upright structure A′ is provided with wheels *a*, which travel upon tracks B, preferably laid parallel with the edge of the wharf. The upright frame structure has vertical guides A^3 and A^3, by means of which the car elevating and tilting support is guided. Said support consists of two transverse beams C and C′ and a platform C^2, supported upon said beams. Chains D and D′ are secured to the beams, pass over pulleys *a*′ at the upper ends of the vertical guides, the pulleys upon the guides A^3 being above the pulleys upon guides A^3, under pulleys a^2 at the lower ends of said guides, over pulleys *d* upon the piston-rods *d*′ of hydrostatic cylinders D^2 and D^2, and are then secured to the frame structure. The cylinders are preferably secured to the outer sides of the vertical guides.

For the purpose of insuring absolute evenness in the upward or downward motion of each beam a shaft *c* is journaled upon the beam and parallel with the same, and said shaft has pinions *c*′ upon its ends, which engage racks a^3 upon the vertical guides. The platform of the elevating and tilting support is hinged to one beam C by means of cars c^2, through which passes a shaft c^3, which rocks in bearings c^4 upon the beam. The other end of the platform rests upon rollers c^5, which are journaled upon the top of the other beam C′, so that the platform may have a longitudinally-movable support when the beam is raised, while the beam under the other end remains stationary.

Inclined approaches A^4 are provided at each end of the frame structure and have rails a^4, which meet both ends of rails c^6 upon the platform. The lower ends of the inclined rails are so constructed that they may bear upon the tops of the rails *e* of the railroad track or siding, upon which the cars to be elevated and dumped run. A hinged stop F upon the platform serves to prevent longitudinal movement of the car when the latter and the platform are tilted, the stop engaging the draw-head and bumpers at the end of the car.

A rigid hopper G is constructed at one end of the frame structure and has its bottom inclined toward the front of the wharf, where it extends into an inclined chute G′. A jib H is pivoted to the frame structure at the lower end of the chute, and a chute J is hinged to the lower end of the rigid chute, so as to form a continuation for said latter chute. A cylindrical spout K is supported by means of chains *k* from the jib and has an elbow *k*′ at its upper end, into which the lower end

of the hinged chute projects. A cylindrical spout K′ telescopes upon the upper spout, and said spouts have chains k^2 and k^3 secured to them and carried over pulleys k^4 upon the jib to the structure, so that the spout-sections may be raised or lowered by said chains. One or more chains h is secured to the jib and passes over a pulley or pulleys h' at the top of the frame structure, so that the jib may be raised to swing the hinged chute and the telescoping spout-sections up against the side of the structure and out of the way of vessels in front of the wharf. The jib is supported in its lowered position by a linked guy-rod h^2.

In practice the wheeled frame structure is moved upon its track until it arrives opposite the place where the discharge of the contents of the cars to be unloaded is to be made. In the illustrated case the structure is opposite the hatchway of a vessel lying alongside of the wharf. The car to be unloaded is drawn up at one of the inclined approaches onto the elevator-platform. When the car has been drawn onto the platform, the actuating fluid—steam, air or water under pressure—is admitted into the hydrostatic cylinders, and the elevating-support, with the car upon it, is raised along its vertical guides. When the support arrives at the point which brings one end of the car above the hopper of the frame structure, the hoisting apparatus for that end of the support is stopped, while the other end of the support continues to rise. The car has been secured by means of the end stop, and the end-gate of the car has been opened or removed, so that the contents of the car will be emptied into the hopper, chutes, and spout. The hinged end of the platform remains stationary during the endwise tilting of the car, while the rollers upon the beam which continues to rise move under the platform and allow that end of the latter to be raised.

As the contents of the car fall into the hopper, chutes and spouts the latter will become filled, as the lower end of the lowermost spout-section rests upon the bottom of the vessel or upon the top of the cargo already in the hold. When now the lower spout-section is raised by its chains, the contents of said section may slowly escape under the edge of the section. The upper section may be similarly raised to allow its contents to escape if the pile in the hold of the vessel reaches a height above the lower edge of the upper spout-section. By this telescoping-spout arrangement the contents of the car may gently slide into the hold of the vessel, which is a matter of great importance in the use of an apparatus of this character for unloading coal from cars, as, if the coal has a free slide from the car down to the bottom of the vessel, the coal will be so much broken as to contain too much slack and dust and to deteriorate in value far beyond the saving attained by the rapid unloading of the car. This feature of breakage has been largely instrumental in preventing the employment of otherwise practical car-unloading apparatus for unloading coal, which is the article for which these devices are most desired and the handling of which forms the greatest item of cost.

As the hoisting mechanism of my apparatus is arranged above and at the sides of the bottom of the frame structure, the car-supporting platform may be lowered to a short distance above the surface of the ground or wharf upon which the frame structure stands, whereby the necessity for drawing the car up a steep incline is avoided.

The structure has preferably two inclined approaches, one at each end, so that after a car has been raised, dumped, and again lowered one car may be drawn upon one incline onto the platform, while the preceding car may run down the other incline off from the platform.

By mounting the apparatus upon wheels the apparatus may be moved to be exactly opposite the point where the discharge of the car-load is to be delivered.

When the apparatus is not in use, the jib, chutes and spout may be raised out of the way of vessels passing along the front of the wharf.

Other modes of applying the principle of my invention may be employed for the mode herein explained. Change may therefore be made as regards the mechanism thus disclosed, provided the principles of construction set forth respectively in the following claims are employed.

I therefore particularly point out and distinctly claim as my invention—

1. In apparatus for hoisting and unloading railway-cars, the combination of a platform upon which a railway-car may be supported, a support to which one end of the platform is hinged, means for raising and lowering said support, another support upon which the other end of the platform is supported and may move longitudinally, and means for raising and lowering said latter support—said two sets of raising and lowering means acting separately and independently of each other, substantially as set forth.

2. In apparatus for hoisting and unloading railway-cars, the combination of a platform upon which a railway-car may be supported, a support to which one end of the platform is hinged, means for raising and lowering said support, another support having a roller upon which the other end of the platform may move longitudinally, and means for raising and lowering said latter support, said two sets of raising and lowering means acting separately and independently of each other, substantially as set forth.

3. In apparatus for hoisting and unloading railway-cars, the combination of an upright frame structure having vertical guides, a beam transverse to said structure and guided by one set of the guides, a transverse beam guided by another set of guides, means for separately raising and lowering each of said

beams, and a platform upon which a railway-car may be supported and having one end hinged to one beam and having rolling support for its other end upon the other beam, substantially as set forth.

4. In apparatus for hoisting and unloading railway-cars, the combination of an upright structure having pairs of vertical guides, a transverse beam guided by one pair of guides, another transverse beam guided by another pair of guides and having a roller upon its upper side, means for separately raising and lowering each of said beams, and a platform upon which a railway-car may be supported and having one end hinged to the first-mentioned beam and having its other end resting upon the roller on the second beam, substantially as set forth.

5. In apparatus for hoisting and unloading railway-cars, the combination of an upright structure having two pairs of vertical guides and inclined approaches at its ends, a transverse beam guided by one pair of guides, another transverse beam guided by the other pair of guides and having a roller upon its upper side, a platform hinged at one end to the first beam and having its other end resting upon the roller of the other beam and having its end registering with the elevated ends of the approaches when the beams are in their lowered positions, hoisting-chains attached to the ends of the beams and carried over guide-pulleys at the upper ends of the vertical guides, and hydrostatic cylinders having their piston-rods connected to operate said chains, substantially as set forth.

6. In apparatus for hoisting and unloading railway-cars, the combination of a base-frame mounted on wheels, two pairs of vertical guides extending from said base-frame, inclined approaches at the ends of the base-frame, transverse beams having their ends guided in the guides, a platform supported by said beams, hoisting-chains attached to said beams and guided over the upper ends of the vertical guides, and hydrostatic cylinders secured upon the outer sides of the vertical guides and having their piston-rods connected to operate the hoisting-chains, substantially as set forth.

In testimony that I claim the foregoing to be my invention I have hereunto set my hand this 5th day of February, A. D. 1885.

PETER RASCH.

Witnesses:
WM. SECHER,
DAVID T. DAVIES.

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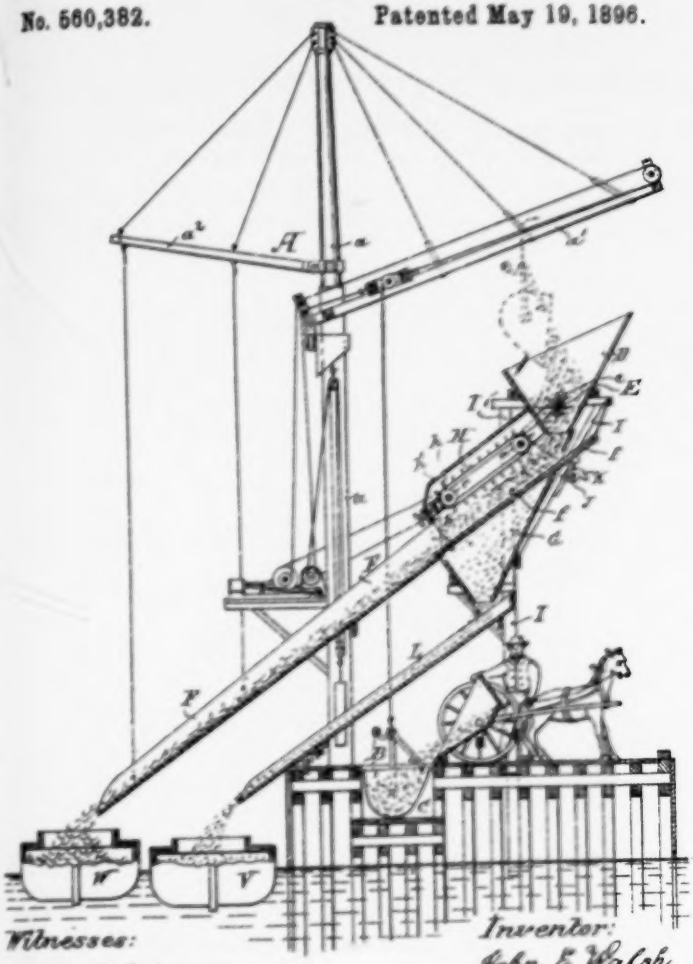
278

(No Model.)

J. E. WALSH.

COMBINED APPARATUS FOR SEPARATING AND HANDLING REFUSE OF CITIES.

No. 560,382. Patented May 19, 1896.



Witnesses:

Philip J. Ryan.

Peter Rogers.

Inventor:

John E. Walsh

per Charles Rattigan

his Attorney.

706

279-281

UNITED STATES PATENT OFFICE.

JOHN E. WALSH, OF NEW YORK, N. Y.

COMBINED APPARATUS FOR SEPARATING AND HANDLING REFUSE OF CITIES.

SPECIFICATION forming part of Letters Patent No. 560,382, dated May 19, 1896.

Application filed December 23, 1895. Serial No. 573,166. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. WALSH, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in a Combined Apparatus for Handling and Separating the Refuse of Cities, of which the following is a specification.

My invention relates to improvements in apparatus by means of which the substances contained in the refuse of cities are separated and handled preparatory to transporting them; and my invention consists in a combination of devices by which the ashes contained in the refuse can be separated from the other matter contained therein, consisting principally of garbage and the like, and each part can be loaded separately into one of two or more vessels lying beside each other.

The figure shown in the accompanying drawing represents a side elevation, partially in section, of the improved apparatus for handling and separating the refuse of cities, the latter standing in front and the crane standing closely behind it.

The mast *a* of the crane A is secured near one side or end of a dock and provided with two or more booms a' a^2, one of which carries the chute leading from the separator to the hatches of vessels to be loaded, while the other serves to raise the bucket B from a cavity C, provided in the dock near the socket of the mast, after it has been loaded with refuse, and to carry it in the customary manner over the upper hopper D, into which the load is discharged.

The hopper D is provided near its discharge-opening with a rotating stirrer E, mounted upon a horizontal shaft *e*, to facilitate the discharge and prevent the clogging of the opening. From the hopper D the refuse matter drops upon the bottom of an inclined trough or chute F, the outer end of which leads to the hatch of the outer vessel W and is supported from the outer boom a^2 of the crane, while the upper end of the chute is provided with a perforated rocking bottom *f*, which permits the ashes to drop into the lower hopper G, while the garbage and larger matter will pass down the chute F into the hold of the outer vessel W. To prevent clogging at the point of discharge from the hopper D, a continuous belt H is mounted upon adjustable rollers *r*, secured to the stationary frame I, supporting the hoppers, in such a position that its lower section travels parallel to the bottom of the chute F and in a downward direction. This belt H is provided along its entire length with projecting prongs *h*, which while the belt is traveling along will touch the upper layers of the refuse sliding down the chute F and will assist to separate the garbage from the ashes, the speed of the belt being so regulated as to give the best practical results. To prevent the arising of dust, a cover *h'* is mounted over the endless belt H and the rocking bottom *f*, as shown in the drawing. To secure a thorough sifting and separation of the ashes, a shaft J, carrying a cam K, is mounted upon the frame I and will, when revolved by means of a belt and pulley from an engine, vibrate the perforated bottom *f*. The thus separated ashes will pass through the hopper G and will slide along the chute L to the vessel V placed nearer to the dock. All the moving parts of the apparatus are actuated by means of pulleys and belts from an engine, preferably mounted upon the crane A. The garbage and ashes will thus be separated and loaded into separate vessels as soon as received and dumped at the dock, saving considerable time and labor. Both chutes F and L are made adjustable.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination of a hopper D, a stirrer E, a chute F, a perforated rocking bottom *f*, a shaft J, a cam K, an endless barbed belt H, a hopper G, chute L, frame I, crane A, and means for operating the moving parts as and for the purposes herein shown and described.

2. The combination of a hopper D, and a stirrer E with a chute F having a perforated rocking bottom, an endless barbed belt H, and means for supporting and operating the parts, as and for the purposes herein shown and set forth.

Signed at New York, in the county of New York and State of New York, this 21st day of December, A. D. 1895.

JOHN E. WALSH.

Witnesses:
JULIUS HAAGER,
H. C. MECKLEM, Jr.

(No Model.)

C. E. BIRD.

ADJUSTABLE SWIVELED GRAIN SPOUT.

No. 582,598. Patented May 11, 1897.

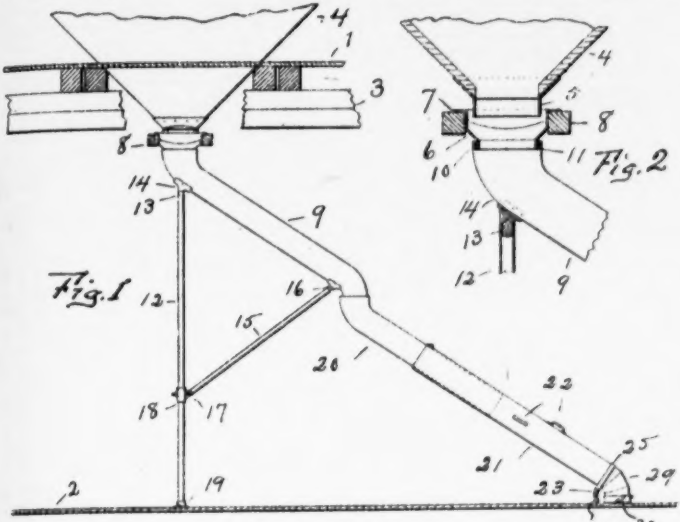


Fig. 1

Fig. 2

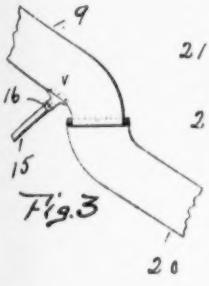


Fig. 3

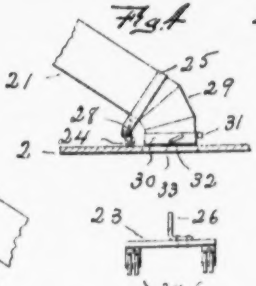


Fig. 4

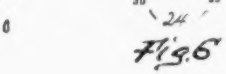


Fig. 6

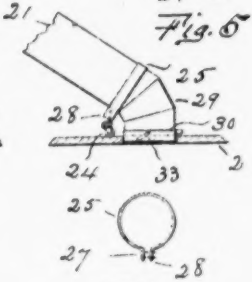


Fig. 6

Fig. 7

Witnesses
R. Blume
Carolyn Tolchin

Inventor
Charles E. Bird
By Attorney
H. H. Gunckel

UNITED STATES PATENT OFFICE.

CHARLES E. BIRD, OF MINNEAPOLIS, *MINNESOTA*, ASSIGNOR OF ONE-HALF TO HONSTAIN BROS., OF SAME PLACE.

ADJUSTABLE SWIVELED GRAIN-SPOUT.

SPECIFICATION forming part of Letters Patent No. 582,598, dated May 11, 1897.

Application filed February 11, 1897. Serial No. 622,959. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. BIRD, a citizen of the United States, residing in the city of Minneapolis, county of Hennepin, and State of Minnesota, have invented a certain new and useful Improvement in Adjustable Swiveled Grain-Spouts, of which the following is a specification.

My invention relates to the class of adjustable spouts that is used in conveying grain from weighing-hoppers to the openings of a series of conveying-spouts arranged in a floor below at varying distances from the hopper; and the object of the invention is to render the distributing-spout, to which the invention pertains, more readily available for adjustment in respect to its extension or contraction and its movement in arcs, for the purpose of connecting the hopper with the selected bin-spout of the series.

In a general way the invention may be said to comprise a spout composed of sections swiveled together, the lower being preferably formed of telescoping portions, while the upper is connected to the funnel of the hopper in a manner that permits it to be revolved, and a vertical support for the latter member having a connection therewith adapted to permit the necessary up-and-down movement of the spout, and a hinged brace connecting the vertical support to the upper spout member, and the lower end of the lower member being supported by a carriage on casters permitting it to be moved from place to place, and an adjustable hood provided at the bottom for entering the openings in the floor.

The improvements referred to are illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the devices, showing also a portion of the supporting timbers, floors, &c. Fig. 2 is an enlarged detail view of the swiveled connection between the funnel of the hopper, the upper portion of the spout, and the hinged connection between the latter and its supporting-staff. Fig. 3 shows in elevation the manner of connecting the upper with the lower spout-section and also the connection of the brace-bar with the spout. Figs. 4 and 5 show, respectively, the positions of the adjustable lower end of the lower spout-section, the former showing its position above the floor-opening and the latter its operative position; and Figs. 6 and 7 show details of the carriage devices by which the lower end of the spout is supported, so as to render it capable of easy lateral movement when not in use.

In said drawings, 1 and 2 designate, respectively, upper and lower floors; 3, the usual timbers for supporting the floor, hopper, &c., and 4 a grain-hopper which may be connected with weighing-scales, if desired. The funnel end 5 of the hopper 4 is arranged to extend downward within a receiver 6 of somewhat funnel shape which is supported by means of flanges 7, resting on transverse beams 8, so that while the discharge-opening of the hopper 4 registers with the receptacle 6 it is free from direct connection with the supporting devices of the latter, and the settling of the building or other causes affecting the relationship of these parts would not be sufficient, under ordinary circumstances, to vary the functional relationship of the respective parts.

The upper section 9 of the spout is somewhat enlarged at the top and connected to the funnel or base portion of the receptacle or hopper 6 by means of an inwardly-projecting flange 10, which rides upon an outwardly-projecting flange 11, supplied by the funnel end of the part 6, so that the spout 9 may be revolved around the funnel as an axis, while the joint between the two is loose and capable of permitting the raising or lowering of the upper end of the spout 9 within desired limits.

An additional means of support for the spout is provided by the staff 12, the upper end of which is hinged, as at 13, to a plate 14, that is riveted to the under side of the upper spout member at or near its curved portion. The hinged connection referred to is preferably that of a somewhat rounded extension projecting downward from the fixed connection 14 into the hollow end of the staff 12, as indicated in Fig. 2, whereby the revolution and raising and lowering of the spout 9 are rendered practicable; and the lower end of the upper spout member 9 is braced by means of an arm 15, that is hinged, as at 16, to a

plate riveted to the spout, and likewise hinged, as at 17, to a sleeve 18, that is arranged to slide up or down on the staff 12 and to be secured by a set-screw, and the staff being stepped, as at 19, is free to turn, and the spout member 9 may not only be revolved about the staff, but may be raised or lowered, as desired, without moving the staff, the brace 15 being adjusted accordingly.

To the curved lower end of the spout member 9 is swiveled the lower section 20, preferably by hanging the latter upon the former in the manner indicated in Fig. 3—that is, similar to the upper joint 10 11; and in order that this lower section may be made capable of extension and contraction to meet the requirements of service an additional telescoping section 21 is provided, so that the length of the lower spout-section as a whole may be regulated as desired. For convenience of operation in telescoping and revolving the spout handles 22 are provided on the lower section.

In order to support the lower end of the spout and permit it to be easily and freely moved from one to another position, a carriage 23, riding on casters 24, is provided and connected to the spout by means of a ring 25, to which the carriage is attached by a lug 26, which is made to pass upward into an opening 27 between the projecting jaws 28 of the ring and fastened by bolts.

The lower end of the spout 20 is of curved or elbow form, as shown at 29, and its extreme lower portion is encompassed by a telescoping short section or hood 30, which may be revolved by means of a handle 31, and having in it an inclined slot 32, within which there projects from the inner pipe-section a pin 33. The hood may be raised when it is desired to move the spout from one position to another and lowered through an opening in the floor by operating the handle 31, as indicated by the positions shown, respectively, in Figs. 4 and 5.

In use, the construction and arrangement of devices being as described, the spout as a whole may be adjusted readily and accurately from one to another position within the limits of its outer circle of movement and any desired position in arcs of circles intermediate that and a circle close to the center of movement. The character of the connections with the discharge-outlet of the hopper, and the jointed and swiveled connections with the supporting staff and brace, and the swiveled and telescoping lower spout member, together with its means of support, are such that the spout as a whole may be extended or contracted or revolved and its lower end inserted in an opening in the supporting-floor to the end of rendering the spout a convenient, practical, and desirable device for use in elevators for conveying grain from a weighing or other hopper to one or another bin or receptacle.

Having described my invention, what I claim is—

1. The combination in an adjustable grain-spout, of upper and lower members having elbowed ends swiveled together so that the latter may revolve in a circle about the former; a swiveled support for the head of the upper member; a staff aiding in the support thereof, and an adjustable hinged brace connected to said staff and to the lower portion of said upper spout-section, substantially as set forth.

2. The combination in an adjustable grain-spout, of upper and lower members having elbowed ends swiveled together so that the latter may revolve in a circle about the former; a swiveled support for the head of said upper member; a staff aiding in the support thereof; an adjustable hinged brace connected to said staff and to the lower portion of said upper spout-section; the lower spout-section being composed of telescoping portions whereby its length may be regulated as desired, substantially as set forth.

In testimony whereof I have hereunto set my hand this 6th day of February, 1897.

CHARLES E. BIRD.

In presence of—
P. H. GUNCKEL,
R. BLUME.

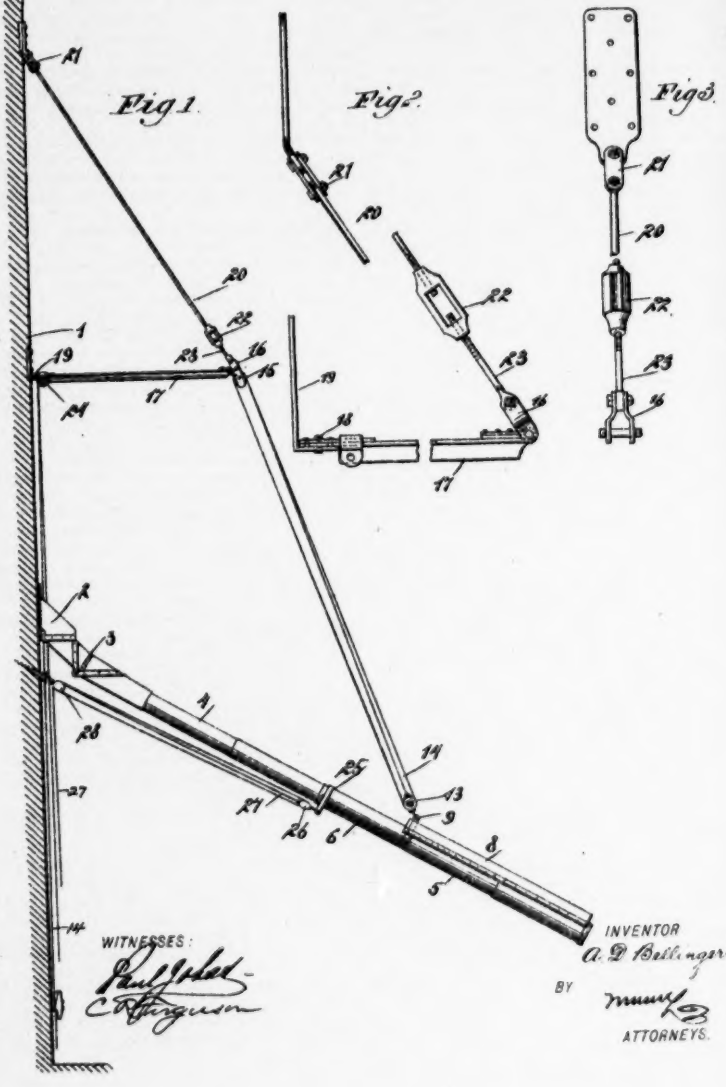
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A. D. BELLINGER.

GRAIN SPOUT.

No. 605,375. Patented June 7, 1898.



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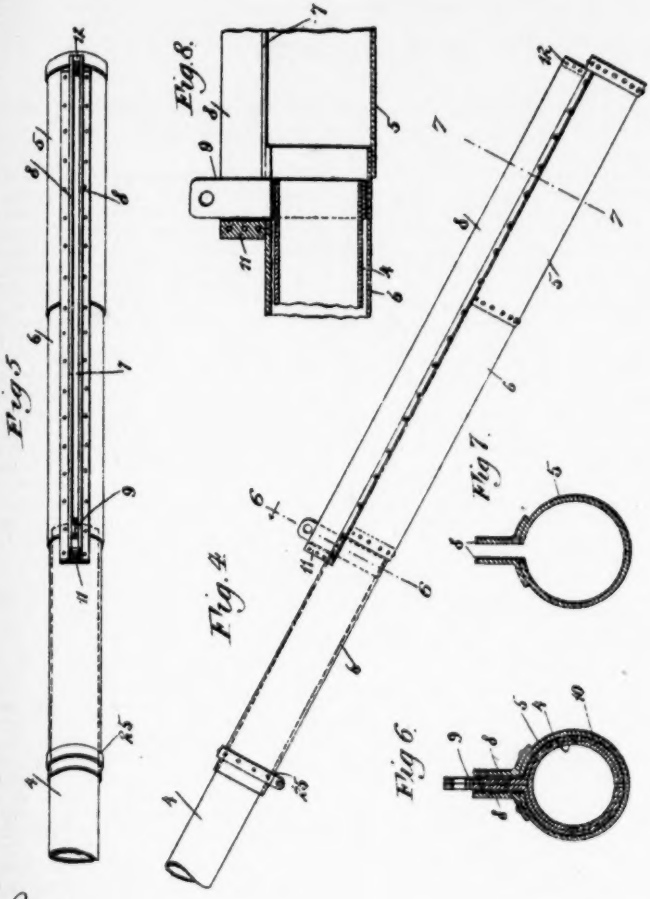
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(No Model.) 2 Sheets—Sheet 2.

A. D. BELLINGER.

GRAIN SPOUT.

No. 605,375. Patented June 7, 1898.



WITNESSES:

INVENTOR
A. D. Bellinger.
BY
ATTORNEYS.

712

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UNITED STATES PATENT OFFICE.

ALBERT DELOSS BELLINGER, OF WEST SUPERIOR, WISCONSIN.

GRAIN-SPOUT.

SPECIFICATION forming part of Letters Patent No. 605,375, dated June 7, 1898.

Application filed November 29, 1897. Serial No. 660,053. (No model.)

To all whom it may concern:

Be it known that I, ALBERT DELOSS BELLINGER, of West Superior, in the county of Douglas and State of Wisconsin, have invented a new and Improved Grain-Spout, of which the following is a full, clear, and exact description.

This invention relates to spouts for loading grain from elevators into boats; and the object is to provide a spout that may be easily manipulated to direct grain to any part of a boat and that may be quickly shortened and lengthened at will.

I will describe a grain-spout embodying my invention, and then point out the novel features in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of a grain-spout embodying my invention. Fig. 2 is a side elevation of a supporting device therefor. Fig. 3 is a front view thereof. Fig. 4 is a side elevation of the spout, drawn on an enlarged scale. Fig. 5 is a top plan thereof. Fig. 6 is a section through the line 6 6 of Fig. 4. Fig. 7 is a section through the line 7 7 of Fig. 4, and Fig. 8 is a longitudinal section of a portion of the spout.

Referring to the drawings, 1 designates the wall of a grain-elevator and through which a short spout 2 leads. Pivotally connected to the short spout 2, as at 3, is what I term the "inner" grain-spout 4.

Mounted to slide on the section 4 of the grain-spout is a section 5, having an extension 6 at its upper end engaging over the section 4 of the spout. The section 5 of the spout is longitudinally slotted, as at 7, and extended upward from the section at the opposite sides of the slot 7 are plates 8. These plates 8 will not only strengthen the section 5 of the spout, so that it may be made of comparatively thin iron, but will form guideways for an arm 9, extended through the slot and between the plates. The said arm 9 is formed by the ends of a ring 10, engaging around the lower end of the inner section 4 of the spout.

Blocks 11 12 are arranged between the plates 8 at the ends. These blocks 11 12 by coming into engagement with the arm 9 will prevent the section 5 of the spout from moving too far in either direction. Attached to the arm 9 is a pulley-block 13, from which a rope 14 extends to a pulley-block 15, arranged in a clip 16, secured to the outer end of an arm 17, extended from the elevator-wall 1. This arm 17 may have a pivotal connection, as at 18, with a bracket 19, attached to the elevator-wall.

From the outer end of the arm 17 or from the clip 16 thereon a support 20 extends upward and is connected at its upper end to a metal plate 21, secured to the elevator-wall. As shown in the drawings, the support 20 may have a turnbuckle connection 22 with a rod 23, extended from the clip 16. The rope 14 extends along the arm 17 and over a pulley 24 at the inner end of said arm, and thence downward to the lower portion of the elevator.

On the upper end of the section 6 of the spout is a ring 25, to which a pulley-block 26 is connected. From this pulley-block 26 a rope 27 extends to a pulley-block 28, attached to the elevator-wall and thence downward to the lower portion of the elevator. In operation by drawing upon the rope 27 it is obvious that the sections 5 6 of the spout may be moved longitudinally of the section 4 to shorten the spout as the bulk of grain increases in the boat to be loaded. By releasing the rope the movable section will slide down by gravity. The entire spout may be raised and lowered, as shown, by means of the rope 14.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A grain-spout, comprising two telescopic sections, one of said sections being longitudinally slotted at the top and adapted to slide on the other section, an arm extended from the lower end of the upper section through said slot, means for raising and lowering the spout, and means for moving the movable section on the other section, substantially as specified.

2. A grain-spout, comprising a section having a hinged connection with an elevator-wall, a lower section having an extension engaging around the first-named section, the said

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lower section being longitudinally slotted, plates extended upward at opposite sides of the slot, an arm extended from the hinged section and extended through the slot, a lifting-rope having connection with said arm, and a draw-rope having connection with the extension of the slotted section, whereby said slotted section may be moved longitudinally of the hinged section.

ALBERT DELOSS BELLINGER.

Witnesses:
J. A. MURPHY,
CHAS. MURPHY.

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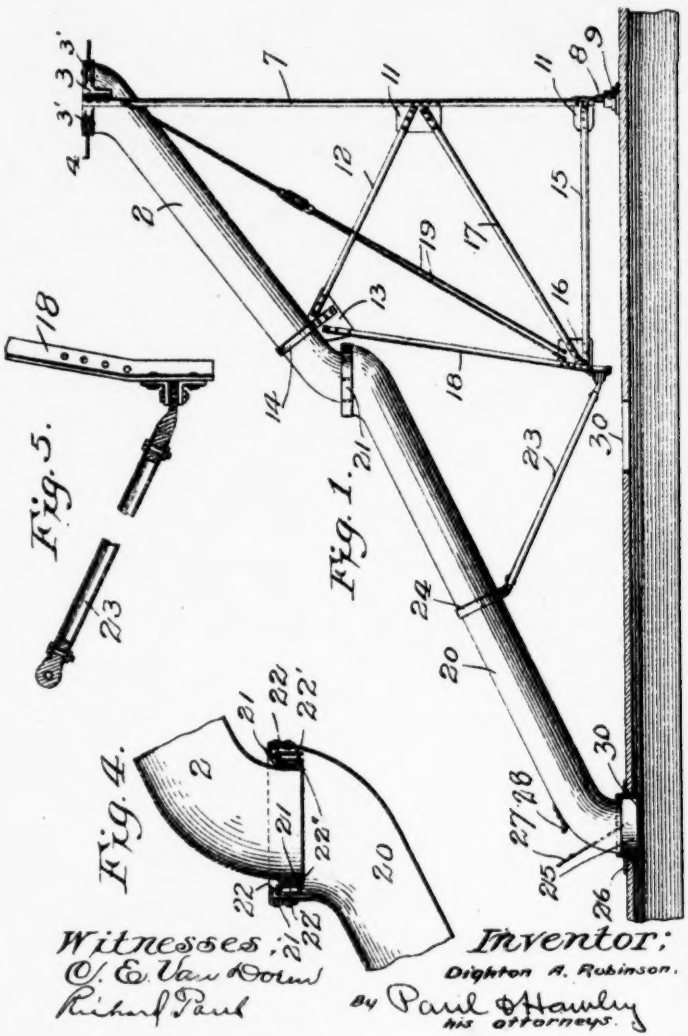
No. 622,018. Patented Mar. 28, 1899.

D. A. ROBINSON.

SWIVELED SPOUT FOR ELEVATORS.

(Application filed June 24, 1898.)

(No Model.) 3 Sheets—Sheet 1.



Witnesses:
C. E. Van Doren
Richard Paul

Inventor:
Dighton A. Robinson.
By Paul & Hawley
his attorneys.

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No. 622,019. Patented Mar. 28, 1899.

D. A. ROBINSON.

SWIVELED SPOUT FOR ELEVATORS.

(Application filed June 24, 1898.)

(No Model.) 3 Sheets—Sheet 2.

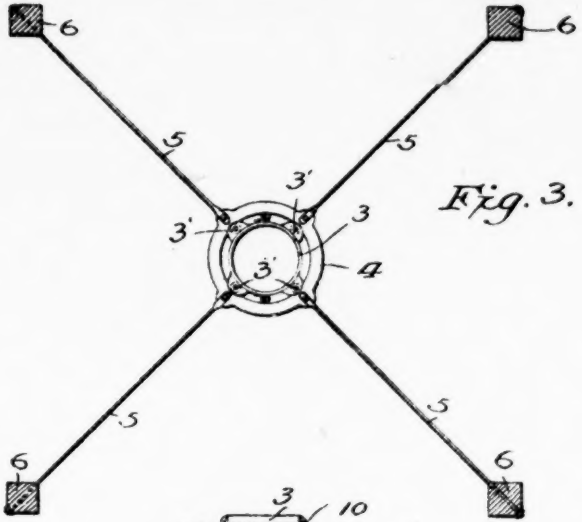


Fig. 3.

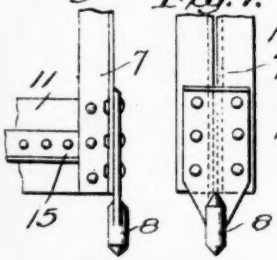


Fig. 6.

Fig. 7.

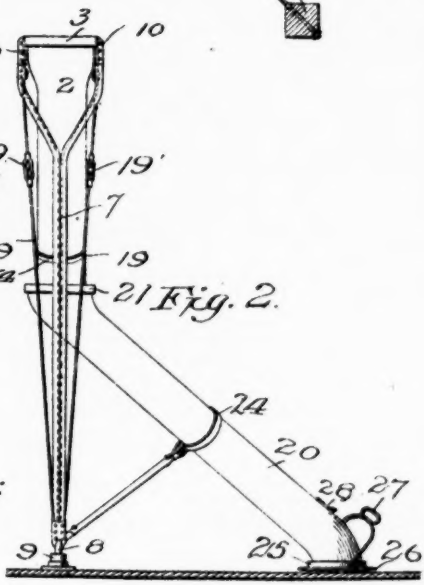


Fig. 2.

Inventor;
Dighton A. Robinson
By Paul & Hanley
his Attorneys

Witnesses;
C. E. Van Doren
Richard Paul

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No. 622,019. Patented Mar. 28, 1899.

D. A. ROBINSON.

SWIVELED SPOUT FOR ELEVATORS.

(Application filed June 24, 1898.)

(No Model.) 3 Sheets—Sheet 3.

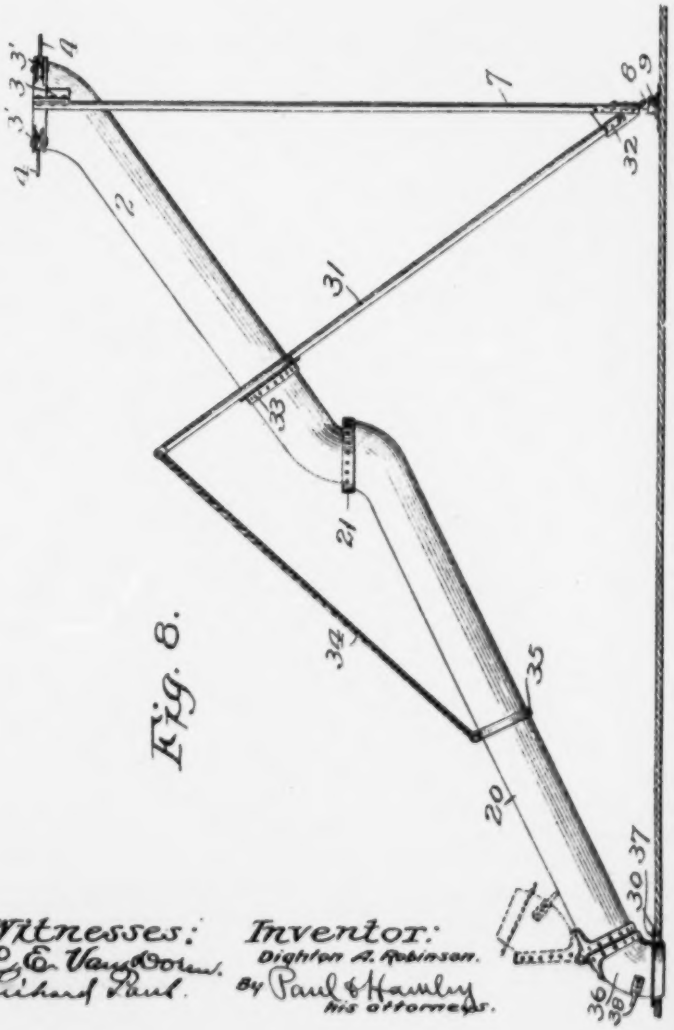


Fig. 8.

Witnesses:
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Richard Paul.

Inventor:
Dighton A. Robinson.
By Paul & Hamby
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UNITED STATES PATENT OFFICE.

DIGHTON A. ROBINSON, OF MINNEAPOLIS, MINNESOTA.

SWIVELED SPOUT FOR ELEVATORS

SPECIFICATION forming part of Letters Patent No. 622,019, dated March 28, 1899.

Application filed June 24, 1898. Serial No. 684,343. (No model.)

To all whom it may concern:

Be it known that I, DIGHTON A. ROBINSON, of Minneapolis, county of Hennepin, and State of Minnesota, have invented certain new and useful Improvements in Swiveled Spouts for Elevators, of which the following is a specification.

The invention relates to swiveled spouts for grain-elevators, and particularly to spouts for distributing grain from the scale-hopper to the different storage-bins, said spouts comprising jointed sections revolubly supported beneath the scale-hopper and adapted to discharge grain into openings in the floor at any point within the area of a circle described by the combined or aggregate lengths of the several sections.

The object of the invention is to provide means for supporting the lower section of the spout without the necessity of using rollers or carriages to travel upon the elevator-floor.

The invention consists generally in an upper inclined spout-section revolubly supported beneath the scale-hopper and a lower independent inclined section having its upper end revolubly connected to the lower end of said upper section and means supporting the lower end of said independent section independently of the elevator-floor.

Further, the invention consists in various constructions and combinations, all as hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation of a swiveled spout embodying my invention. Fig. 2 is a rear end view of the same. Fig. 3 is a sectional plan view. Fig. 4 is a detail of the swiveled connection between the upper and lower section. Fig. 5 is a detail of the pivoted braces supporting the lower section. Figs. 6 and 7 are details of the lower end of the mast or shaft whereon the upper section is supported. Fig. 8 is a side elevation of a modified means for supporting the lower end of the lower spout-section.

The distributing-spout is preferably made in two inclined sections, the upper section 2 being preferably provided at its upper end with a cast ring 3, wherein a series of friction-rolls 3' are mounted in position to engage the inner edge of an outer inclosing ring 4, that is preferably held in position by horizontal guy rods or wires 5 5, adjustably secured to the posts 6 6 upon the four sides of the spout and holding the upper end of the spout concentric with the scale-hopper, while permitting the free revolution of the section.

As a vertical support for the spout I prefer to provide a mast or standard 7, having a stud 8 at its lower end journaled in a step or bearing 9 upon the elevator-floor, wherein the standard turns when the spout is revolved, said standard being preferably forked near its upper end, the arms or tines of the fork extending upon either side of the upper section and being rigidly secured to flanges 10, provided on the inner ring 3. At the lower end of the standard and at a point preferably near the middle thereof are gusset-plates 11, the upper plate being connected by a bar 12 with a similar plate 13, that is secured to the lower end of the upper section 2 by a collar or band 14. A horizontal bar 15 connects the lower plate 11 with a similar plate 16, which is in turn connected with the upper plate 11 and the plate 13 by braces or bars 17 and 18. These braces are preferably of channel or angle iron to increase the strength and rigidity of the truss-frame. To aid in supporting the spout and particularly to prevent any undue lateral twist or strain upon the mast, I may provide guy-rods 19, having turnbuckles 19', connecting the plate 16 with the forked upper end of the standard 7. The lower inclined section 20 of the spout is provided at its upper end with a ring 21, having a depending flange 22, engaging friction-rolls 22', provided on a ring 22'' at the lower end of the upper section, whereby the two parts are swiveled together and the lower section is permitted to revolve independently of the upper section.

To support the lower end of the lower section and at the same time permit the section to be moved independently of the upper section, I provide a brace 23, pivoted at one end to a band 24 upon the lower section and at its other end pivoted to an extension on the lower end of the brace 18. The lower pivot is located substantially in a line with the center or axis of the lower end of the upper spout-section. This bar or brace 23, while supporting the lower section and preventing it from

sagging or resting upon the floor, at the same time permits it to be swung around independently of the upper section or in conjunction with it, as the operator may desire, to direct the grain into openings located at any desired points within the circle described by the combined lengths of the spout-sections.

As the lower end of the lower section does not touch the floor it is desirable to provide a device to close the gap between the lower end of the section and one of the openings 30, irregularly arranged in the floor and leading to the bins beneath. Any suitable device may be used for this purpose. In Fig. 1 I show a sleeve 25, fitting the openings in the floor and adapted to slide over the lower end of the spout and provided with a laterally-projecting flange 26 to rest upon the floor about one of the openings therein and having a handle 27, which the operator may grasp to raise up the sleeve when it is desired to move the spout. To hold the sleeve in an elevated position, a hook 28 may be provided near the lower end of the spout, over which the operator may place the handle while changing the position of the spout.

Instead of using a truss-frame I may employ the device shown in Fig. 8 for supporting the lower end of the inclined lower spout-section above the elevator-floor, said device consisting of an inclined brace or bar 31, rigidly secured at its lower end to a plate 32, provided on the mast 7, preferably near its lower end. The bar 31 extends up beneath the upper spout-section, and at a point preferably near the lower end of said section is looped around it and rigidly secured to a flanged collar 33 thereon. The upper end of the bar 31 is coincident or in line with the vertical axis of the lower end of the upper section and is connected by a chain 34 or by a bar, if preferred, with a band 35 upon the lower section 20, said band being placed in such a position upon the lower spout-section that the lower end of said section is supported above the floor without the aid of rollers or carriages and the whole section permitted to revolve independently of the upper section or in conjunction with it, as may be desired.

In Fig. 8 I have shown another construction for making a close fit with the openings in the floor. As here shown, at the lower end of the lower section I provide a short elbow 36, having a flange 37 near its lower end to rest upon the floor about an opening therein and pivoted at its upper end to the lower section and forming when in use a continuation of said section and filling the gap between the lower end of the section and the floor. When it is desired to change the position of the section, the elbow may be turned back with the aid of the handle 38 to the position indicated by dotted lines in the figure.

In other respects the construction shown in Fig. 8 is substantially the same as that heretofore described with reference to Figs. 1, 2, and 3.

A distributing-spout comprising upper and lower inclined sections constructed and mounted in the manner heretofore described may be revolved about the vertical axis of the receiving end of the upper section without touching the floor or being supported by carriages or rollers resting thereon, and the lower inclined section may be revolved not only in conjunction with the upper inclined section, but also independently of said upper section and about the vertical axis of the lower end of said upper section. This arrangement permits the operator to adjust the lower end of the lower section to discharge the contents of the spout into an opening in the floor at any point in the area of a circle whose radius is equal to the combined lengths of the spout-sections. This construction also permits me to dispense with the usual rollers or carriages for supporting the lower spout-section, and the rigid frame between the vertical standard and the spout-sections prevents any sagging of the spout and supports the lower spout-section at the desired distance from the floor and permits it to be easily revolved to adjust its discharge end over the opening leading to the bin into which it is desired to convey the grain.

The important feature of the invention is that the lower inclined spout-section be revolubly supported on the lower end of the upper spout-section with the lower end of the lower spout-section above the floor, so as to swing clear thereof. It is therefore immaterial whether the support for the lower spout-section be arranged below the upper spout-section, as in Fig. 1, or above it, as in Fig. 8. In either instance the support for the lower spout-section will be provided with a pivot or axis located substantially in a vertical line with the center or axis of the lower end of the upper spout-section and either above or below said lower end of said upper spout-section. I do not therefore limit myself to the details of construction shown and described.

By supporting the lower spout-section above the floor I am able to dispense with the use of rollers or carriages which have been generally used to support the lower end of the lower spout-section, and as distributing-spouts are frequently used before the elevator is completed and when numerous obstructions are scattered through the building it is of great advantage to be able to use the spout independently of a support that rests directly upon the floor. Furthermore, the elevator-floor is frequently covered with grain, and it has been found inconvenient and difficult to push rollers or carriages through and over the grain that lies upon the floor while moving the lower spout-section from one position to another during the operation of distributing the grain from the scale-hopper to the various bins. By suspending the lower spout-section in the manner described I have avoided all those difficulties that are attendant upon the use of a support resting directly upon the floor.

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and the operator is able to swing the distributing-spout easily and quickly to any point within the area of the circle, whose radius is equal to the combined lengths of the two spout-sections.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A distributing-spout for grain-elevators, comprising an inclined upper revolubble spout-section, and an inclined lower revolubble spout-section supported upon, and free to revolve with and about, the lower end of said upper spout-section, and the lower end of said lower spout-section being above and free from the floor, substantially as described.

2. A distributing-spout for grain-elevators, comprising a revoluble upper section, a lower independent section having its upper end supported by said upper section and revoluble independently of the same, and means, independent of the elevator-floor, for supporting the lower end of said lower section, substantially as described.

3. A distributing-spout for grain-elevators, comprising an upper inclined revoluble spout-section and a lower inclined section, a swiveled connection between said upper and lower sections, and means substantially coincident with the vertical axis of the lower end of said upper section for supporting the lower end of said lower section above, and independent of the elevator-floor, substantially as described.

4. A distributing-spout for grain-elevators, comprising an upper inclined revoluble section, a lower inclined section swiveled upon said upper section and revoluble therewith, or independently thereof, a support for said upper section, and a pivotal connection supporting the lower end of said lower section above the elevator-floor and independently thereof, the vertical axis of the lower end of said upper section being substantially coincident with the axis of said pivotal connection at its junction with said support, substantially as described.

5. A distributing-spout for grain-elevators, comprising in combination an upper inclined section revolubly arranged, a standard or mast supporting the same, a lower inclined section revolubly connected to the lower end of said upper section, a brace or bar arranged between said mast and said upper section, a connection between said bar and said lower section, and the junction of said bar and said connection being coincident with the vertical axis of the lower end of said upper section, substantially as described.

6. The combination, with the upper inclined revoluble spout-section, of a lower inclined spout-section, a swiveled connection between said sections, means supporting said upper section, means supporting the lower end of said lower section above and independently of the elevator-floor, and an elbow provided at the lower end of said lower section and adapted to close the gap between said section and the elevator-floor, substantially as described.

7. A distributing-spout for grain-elevators, comprising in combination an upper section revolubly arranged, a standard or mast supporting the same, a lower section revolubly connected to the lower end of said upper section, a brace or bar arranged between said mast and said upper section and having a looped portion to embrace said section, and the upper end of said bar being coincident with the vertical axis of the lower end of said upper section, and a flexible connection between said upper end and said lower section, substantially as described.

8. A distributing-spout for grain-elevators, comprising an upper section, a lower section having its upper end revolubly connected to the lower end of said upper section, and means substantially coincident with the vertical axis of the lower end of said upper section for supporting the lower portion of said lower section, substantially as described.

9. A distributing-spout for grain-elevators, comprising an upper revoluble section, a lower section connected at its upper end to the lower end of said upper section and revoluble therewith or independently thereof, and means substantially coincident with the vertical axis of the lower end of said upper section for supporting the lower portion of said lower section, substantially as described.

In testimony whereof I have hereunto set my hand, this 20th day of June, A. D. 1898, at Minneapolis, Hennepin county, Minnesota.

DIGHTON A. ROBINSON.

In presence of—
RICHARD PAUL,
M. C. NOONAN.

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No. 667,335. Patented Feb. 5, 1901.

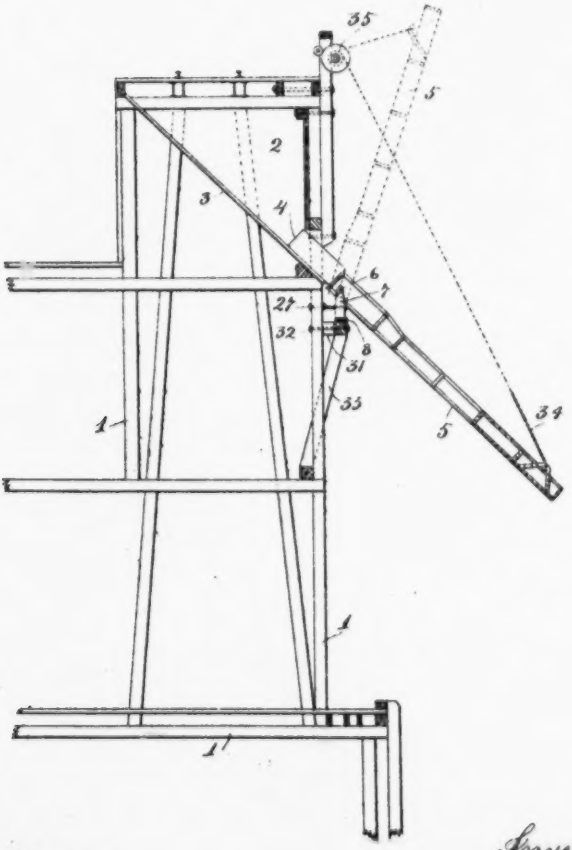
J. L. RECORD.

ADJUSTABLE COAL OR ORE SPOUT.

(Application filed Apr. 28, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses.
A. X. Opsahl.
M. F. Harrison

Inventor.
James L. Record
By his Attorney.
P. H. Gunckel

No. 667,335. Patented Feb. 5, 1901.

J. L. RECORD.

ADJUSTABLE COAL OR ORE SPOUT.

(Application filed Apr. 28, 1900.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

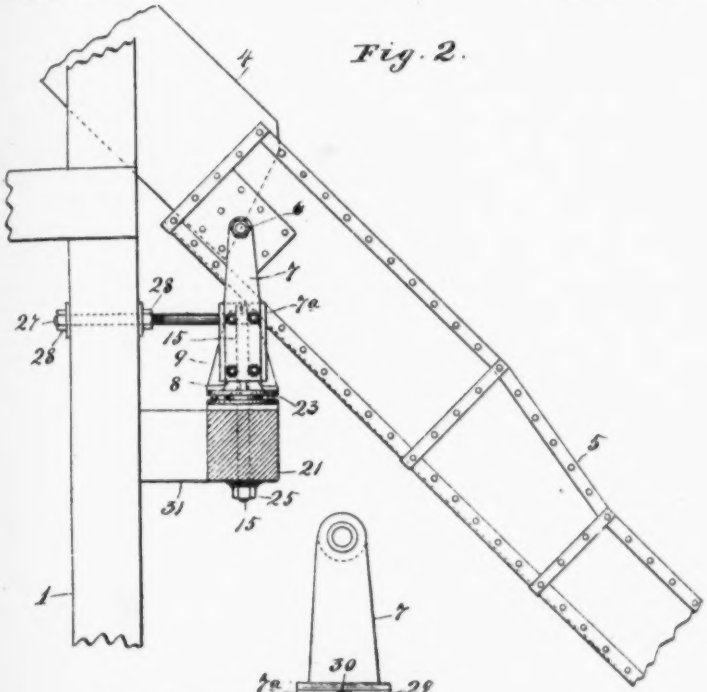
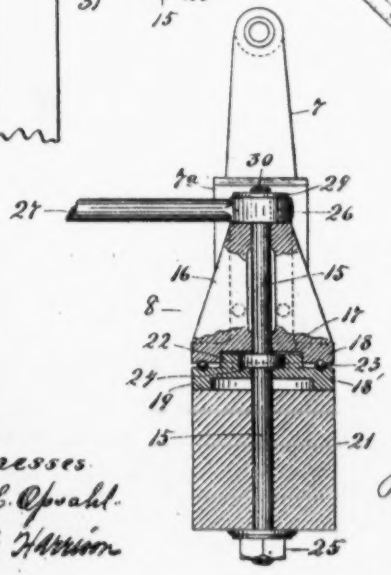


Fig. 3.



Witnesses.
A. H. Opsahl.
M. F. Harrison.

Inventor.
James L. Record
By his Attorney
P. F. Gunakel

306

No. 667,335. Patented Feb. 5, 1901.

J. L. RECORD.

ADJUSTABLE COAL OR ORE SPOUT.

(Application filed Apr. 28, 1900.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 4

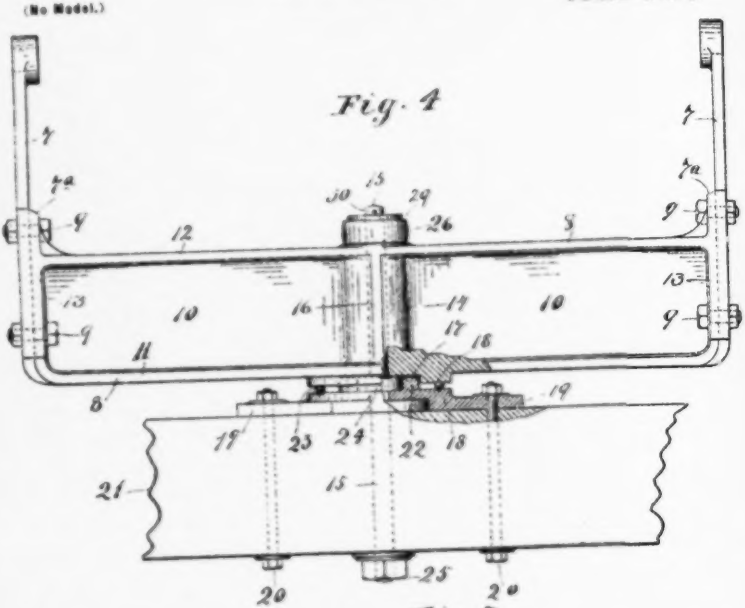


Fig. 5.

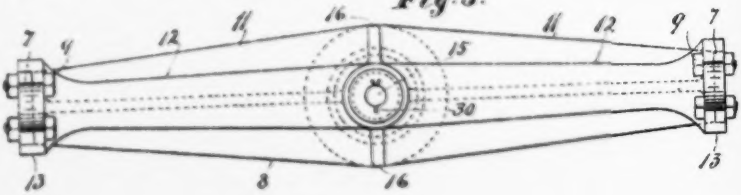


Fig. 6.



Witnesses.
A. H. Ophahl.
M. F. Harrison

Inventor.
James L. Record.
By his Attorney.
O. H. Gunckel

UNITED STATES PATENT OFFICE.

JAMES L. RECORD, OF MINNEAPOLIS, MINNESOTA.

ADJUSTABLE COAL OR ORE SPOUT.

SPECIFICATION forming part of Letters Patent No. 667,335, dated February 5, 1901.

Application filed April 28, 1900. Serial No. 14,677. (No model.)

To all whom it may concern:

Be it known that I, JAMES L. RECORD, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Adjustable Coal or Ore Spouts, of which the following is a specification.

My invention relates to spouts or chutes of the kind employed for conducting coal, ore, and like material by gravity from the bins on docks to vessels; and the object of the invention is to provide a strong and durable spout that is adapted to be easily raised and lowered or turned laterally to desired inclinations.

My improvements relate more especially to the devices for hinging and pivotally supporting such spouts, and they are illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of my improved spout arranged in operative position on a dock. Fig. 2 is a similar view of a portion of the spout and its supports on a larger scale. Fig. 3 is a similar view, partly in vertical section, of the devices for hinging and pivotally supporting the spout. Fig. 4 is a front elevation, with a portion shown in vertical section, of the same devices. Fig. 5 is a plan view of the bolster for supporting the spout, and Fig. 6 is a plan view of the plate providing the antifriction-bearings for the bolster.

In the drawings, 1 designates the framework of an ordinary coal or ore dock, on which is supported a bin 2. The floor 3 of the bin is suitably inclined, and in the discharge-opening is a short permanent chute 4, suitably secured at a like inclination. The spout 5, which is preferably constructed of sheet metal, is arranged with its inner end telescoping loosely a portion of the protruding fixed chute, so that the former may be turned laterally to the required degree without severing its connection with the former to an extent sufficient to interfere with its efficient use.

To support the spout and enable it to be swung laterally as well as vertically, its inner end is connected by pivots 6 to the upper portions of the standards or arms 7 of a rotatable bolster 8. These standards, together with their reinforcing-plates 7ª, are rigidly secured by bolts 9 to the ends of the bolster-body, or they may, if preferred, be formed as an integral part of the bolster-body. The latter body is of inverted-T shape in cross-section, composed of a web 10, having relatively wide flanges 11 at the base and narrower flanges 12 at the top, and from the ends of the web flanges 13 extend in transverse direction for attaching the arms 7. In its center the bolster is provided with a boss or hub 14 for receiving a spindle or pin 15, on which the bolster may be turned. Ribs 16 connect the boss and flanges to increase the strength of the bolster. The under surface of the bolster has a recess 17, concentric with the spindle, and a groove 18, also concentric with the spindle. Beneath the bolster is a plate 19, secured by bolts 20 on a beam 21, and having on its surface a circular rim 22, fitting in the way formed by the recess 17 in the bolster, and having also a circular groove 18', corresponding with the groove 18 in the under surface of the bolster, the two grooves forming a race or way for the bearing-balls 23, which constitute an antifriction-bearing for the bolster and spout it supports. Within the rim 22 is a circular disk 24, through which the spindle passes, and which, in cooperation with the guiding of the rim 22 by the walls of the recess 17, serves to steady and strengthen the pivotal connection of the bolster.

The lower end of the spindle 15 is threaded and secured beneath the beam 21 by a nut 25, and the upper end is secured in an eye 26 on a rod or brace 27, that is secured by nuts 28 to a part of the frame structure 1, a washer 29 on the eye 26 and a cotter 30 through the spindle being used, in cooperation with the nut on the lower end, to secure the spindle in place. The beam 21 may be connected to the frame 1 by timbers 31 and bolts 32 and also by supports 33, that rest on a lower portion of the frame.

Any usual or convenient means may be employed for raising and lowering the spout to the extent desired. The devices shown consist of a chain 34, attached to the outer end of the spout and arranged to be wound, by means of a crank or other device, on a drum or cone-block 35, suitably secured on the upper portion of the framework.

The construction shown and described pro-

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duces a spout that is capable of being easily turned on its vertical pivot in lateral direction, as required, and also easily turned on its horizontal pivots to raise and lower it, and at the same time possesses the required strength and durability.

Having described my invention, what I claim is—

1. In a discharge apparatus for coal and ore bins, the combination with a stationary chute, of a spout having its upper end arranged to receive the discharge from the chute, a bolster arranged beneath the chute for supporting the receiving end of the spout, standards on the bolster to which the spout is pivotally connected to allow its free end to be raised and lowered, a base on which the bolster is mounted, a spindle connecting them and permitting horizontal rotation of the bolster and spout, and means for raising and lowering the outer end of the spout, substantially as set forth.

2. In a discharge apparatus for coal and ore bins, the combination with a stationary chute, of a spout having its upper end arranged to receive the discharge from the chute, a bolster arranged beneath the chute for supporting the receiving end of the spout, standards on the bolster to which the spout is pivotally connected to allow its free end to be raised and lowered, a base on which the bolster is mounted, a spindle connecting them and permitting horizontal rotation of the bolster and spout, a brace for holding the upper portion of the spindle in place, and means for raising and lowering the outer end of the spout, substantially as set forth.

3. In a discharge apparatus for coal and ore bins, the combination with a stationary chute, of a spout having its upper end arranged to partially surround the mouth of the chute and receive the discharge therefrom, a bolster arranged beneath the chute for supporting the receiving end of the spout, standards on the bolster to which the spout is pivotally connected to allow its free end to be raised and lowered, a base on which the bolster is mounted, a spindle connecting them and permitting horizontal rotation of the bolster and spout, and means for raising and lowering the outer end of the spout whereby it may be elevated to substantially vertical position when not in use, substantially as set forth.

In testimony whereof I have hereunto set my hand this 20th day of April, 1900.

JAMES L. RECORD.

In presence of—
W. R. SINKS,
OTIS W. GETCHELL.

725

310-311

No. 681,378. Patented Aug. 27, 1901.

R. L. SHOEMAKER & F. R. WILLSON, Jr.

PORTABLE ELEVATING MACHINE.

(Application filed Jan. 19, 1901.)

(No Model.) 7 Sheets—Sheet 1

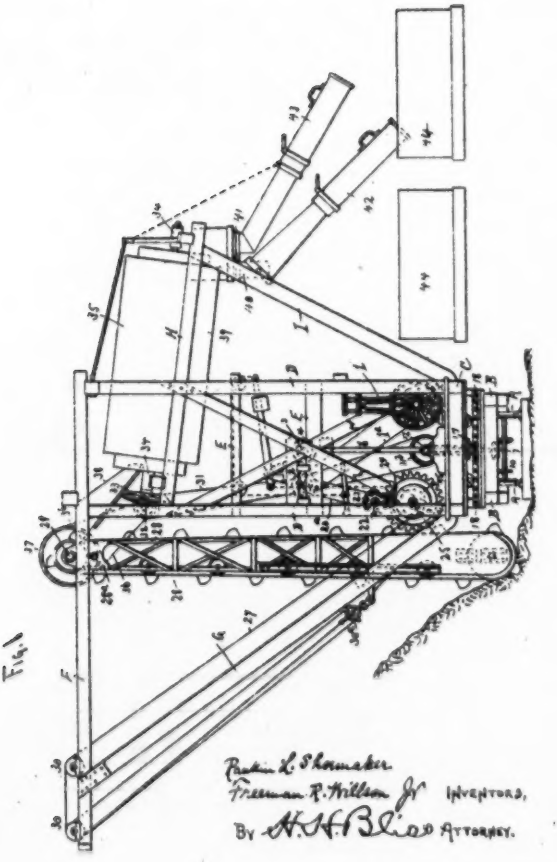


Fig. 1.

Witnesses.
C. H. Woodward
N. Curtis Lamond

Reuben L. Shoemaker
Freeman R. Willson Jr. Inventors,
By A. H. Bliss Attorney.

726

312-313

No. 681,378. Patented Aug. 27, 1901.

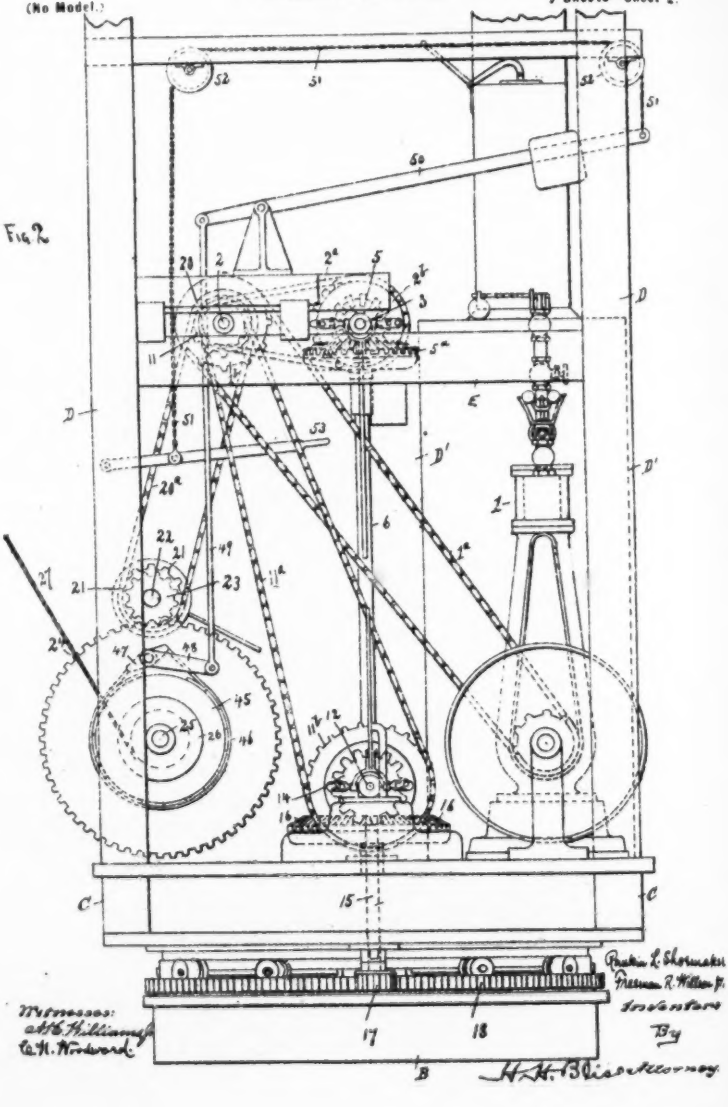
R. L. SHOEMAKER & F. R. WILLSON, Jr.

PORTABLE ELEVATING MACHINE.

(Application filed Jan. 12, 1901.)

(No Model.) 7 Sheets—Sheet 2.

Fig. 2.



Witnesses:
A. H. Williams
C. H. Woodward

Rufus L. Shoemaker
Fessenden R. Willson Jr.
Inventors
By
H. H. Bliss Attorney

314-315

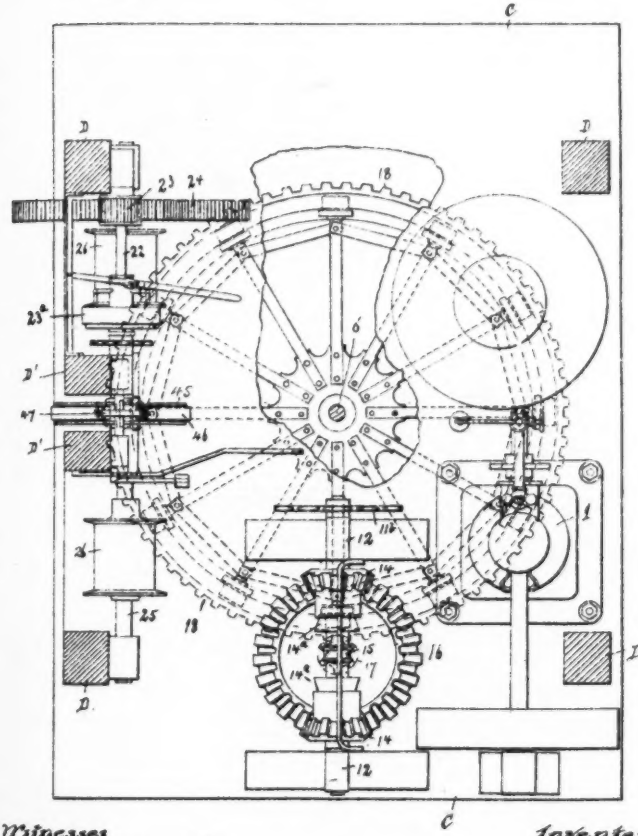
No. 681,378. Patented Aug. 27, 1901.

R. L. SHOEMAKER & F. R. WILLSON, Jr.

PORTABLE ELEVATING MACHINE.

(No Model.) (Application filed Jan. 12, 1901.) 7 Sheets--Sheet 3.

Fig. 3



Witnesses
Albert E. Williams Jr.
G. H. Woodward

Inventors,
Rankin L. Shoemaker
Freeman R. Willson Jr.

By A. H. Bliss
Attorney

728

316-317

No. 681,378. Patented Aug. 27, 1901.

R. L. SHOEMAKER & F. R. WILLSON, Jr.

PORTABLE ELEVATING MACHINE.

(No Model.) (Application filed Jan. 19, 1901.) 7 Sheets—Sheet 4.

Fig. 3

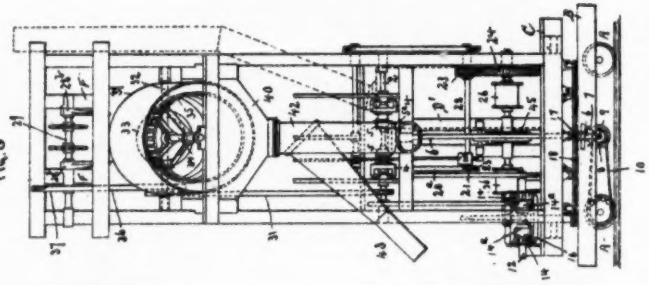
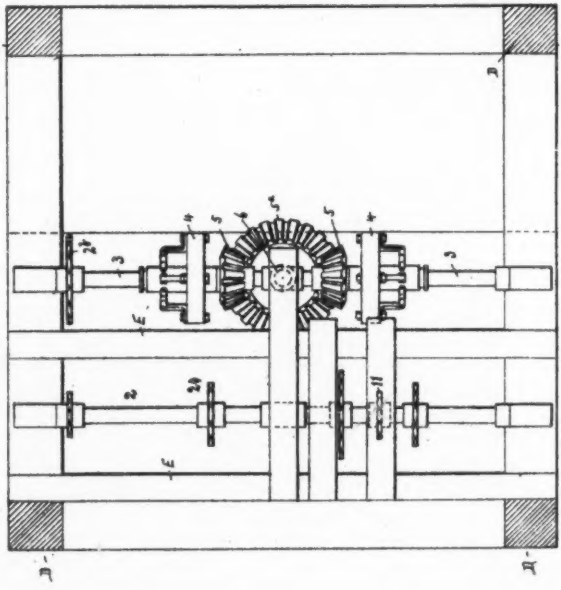


Fig. 4



Witnesses:
Alfred Williams Jr.
G. H. Woodward

Inventors,
Rankin L. Shoemaker
Freeman R. Willson Jr.
By H. H. Bliss
Attorney

729

318-319

No. 681,378. Patented Aug. 27, 1901.

R. L. SHOEMAKER & F. R. WILLSON, JR.

PORTABLE ELEVATING MACHINE.

(No Model.) (Application filed Jan. 19, 1901.) 7 Sheets—Sheet 5.

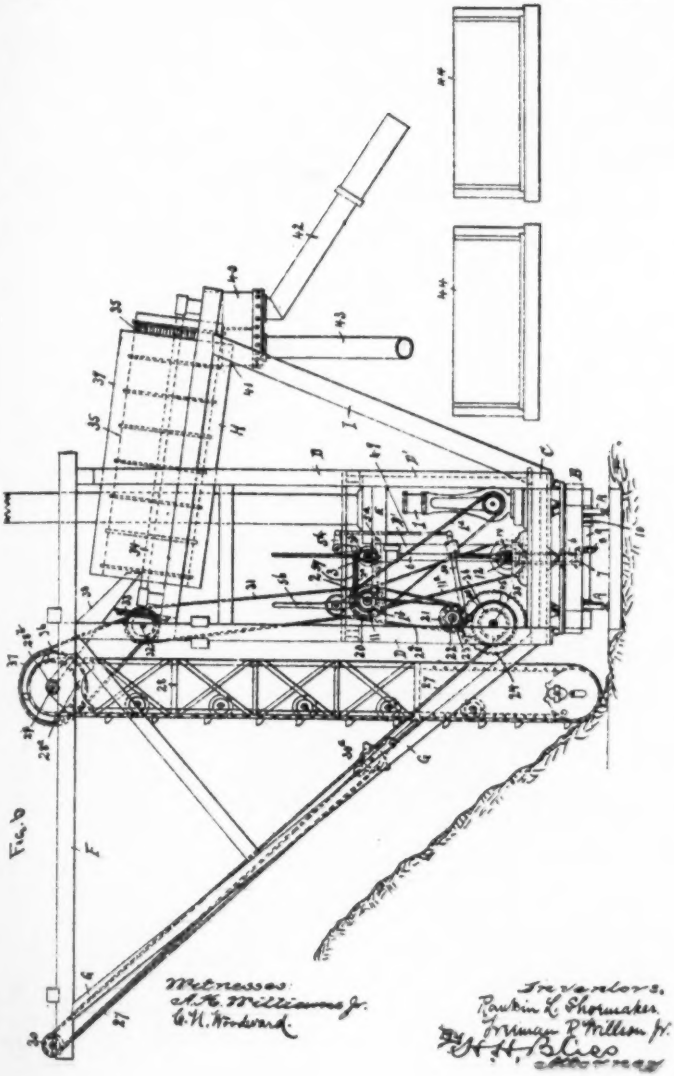


Fig. 5

Witnesses:
A. H. Williams Jr.
G. H. Woodward.

Inventors.
Rankin L. Shoemaker.
Freeman P. Willson Jr.
By H. H. Bliss
Attorney

320-321

No. 681,378. Patented Aug. 27, 1901.

R. L. SHOEMAKER & F. R. WILLSON, Jr.

PORTABLE ELEVATING MACHINE.

(Application filed Jan. 12, 1901.)

(No Model.) 7 Sheets—Sheet 6.

Fig. 6

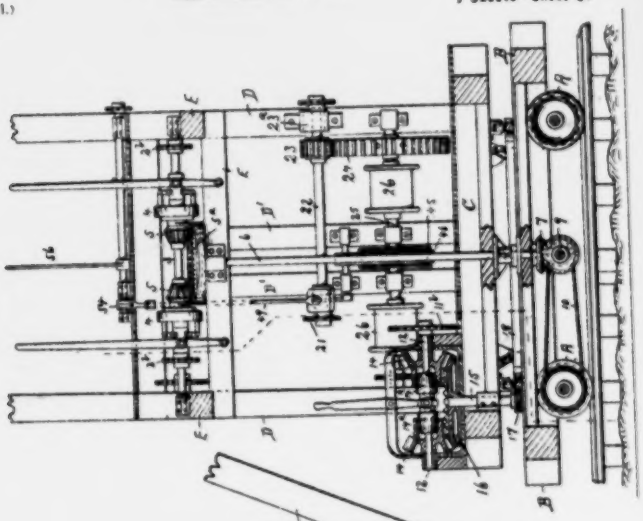
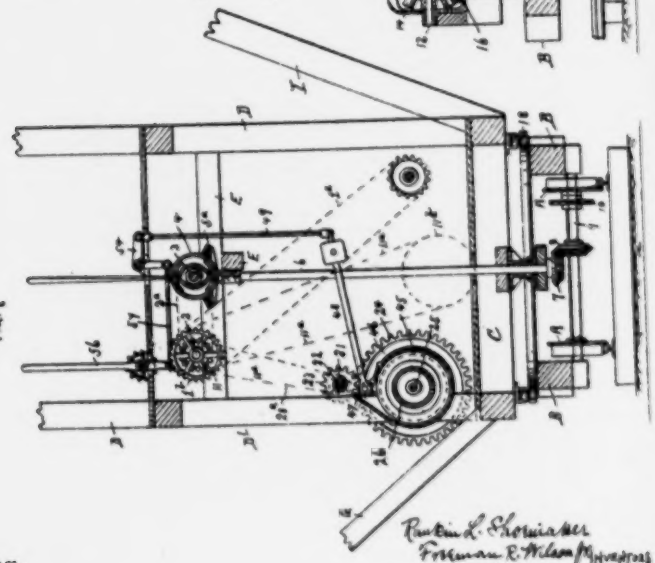


Fig. 7



Witnesses.
G. H. Woodward.
N. Curtis Lammond

Reuben L. Shoemaker
Freeman R. Willson Jr. Inventors
By H. H. Bliss Attorney.

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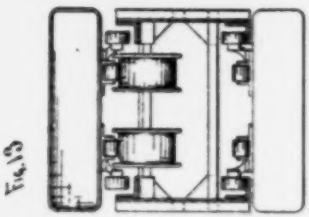
No. 681,378. Patented Aug. 27, 1901.

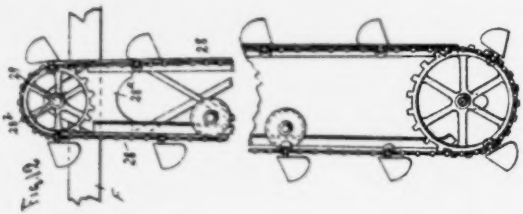
R. L. SHOEMAKER & F. R. WILLSON, Jr.

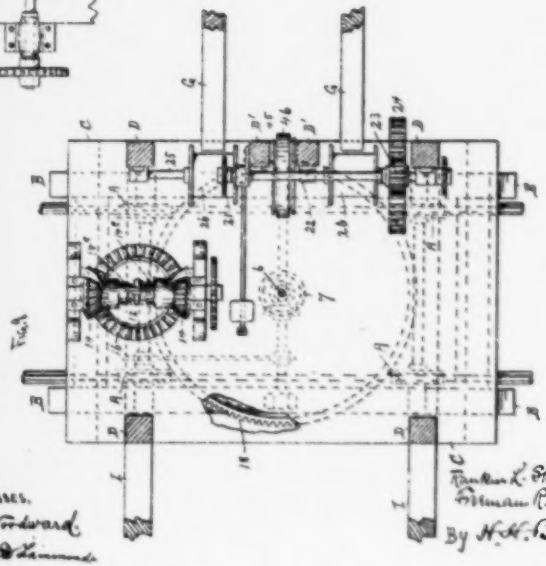
PORTABLE ELEVATING MACHINE.

(No Model.) (Application filed Jan. 18, 1901.) 7 Sheets—Sheet 7









Witnesses,
S. W. Woodward
W. Cook Lemmon

Reuben L. Shoemaker
Francis R. Willson, Jr. Inventors
By W. H. Bliss Attorney.

UNITED STATES PATENT OFFICE.

RANKIN L. SHOEMAKER, OF NEW COMERSTOWN, AND FREEMAN R. WILLSON, JR., OF COLUMBUS, OHIO, ASSIGNORS TO THE JEFFREY MANUFACTURING COMPANY, OF COLUMBUS, OHIO.

PORTABLE ELEVATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 681,378, dated August 27, 1901.

Application filed January 12, 1901. Serial No. 43,048. (No model.)

To all whom it may concern:

Be it known that we, RANKIN L. SHOEMAKER, of New Comerstown, in the county of Tuscarawas, and FREEMAN R. WILLSON, Jr., residing at Columbus, in the county of Franklin, State of Ohio, citizens of the United States, have invented certain new and useful Improvements in Portable Elevating-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a side view of a mechanism embodying our improvements. Fig. 2 is an elevation, on a larger scale, of the operative parts of the mechanism. Fig. 3 is a horizontal section on the line x x of Fig. 2 with the floor partially broken away to illustrate the construction of the frame-revolving mechanism. Fig. 4 is a section on the line y y of Fig. 2, showing the framework and some of the parts attached thereto, looking downward. Fig. 5 is a side elevation looking from the left in Fig. 6. Fig. 6 is a side view of a modified mechanism embodying our improvements. Fig. 7 is an enlarged sectional side elevation. Fig. 8 is an enlarged sectional rear elevation; and Fig. 9 is a transverse section of the lower portion of the supporting-framework and the machinery carried thereby as illustrated in Fig. 6. Figs. 10 and 11 are enlarged details of the mechanism for throwing the hoisting-drums out of gear. Figs. 12 and 13 are enlarged details of the elevator construction.

The operative parts of the mechanism are supported upon a car having wheels A A, adapted to fit ordinary railway-tracks, a bottom truck-body B, resting upon the wheel-axles, and an upper horizontally-adjustable table or bed C. The bed C carries corner-uprights D D and intermediate uprights D'. The uprights are connected together by suitable sills or cross-girths E at suitable distances from the bed, and at the upper end of the main frame there are elongated laterally-projecting overhanging frame-bars F F, the outer ends of which are braced by inclined beams or bars G. In the opposite direction there extends laterally from the main frame a supplemental frame having the top bars H and inclined brace-bars I for the supporting of parts to be described. Upon the framework thus described are supported the mechanism for engaging with and elevating the material, the mechanism for screening and separating, the means for guiding the separated materials to their places of delivery, the parts by which adjustments can be effected of those mechanisms which can be moved upon the frame, the engine or motor, and the means for transmitting power from the latter to the various parts of the machine.

1 is an engine mounted on the bed C and having its shaft connected by a chain 1^a to the chain-wheel 1^b on the shaft 2. This shaft transmits power to the shaft 3 through the chain 2^a and the sprocket-wheel 2^b. The shaft 3 has two loose bevels 5 5, which can be engaged with the shaft by clutches 4 4, respectively.

5^a is a bevel-wheel adapted to be engaged alternately with the bevels 5 5 or be disengaged from both.

6 is a shaft to which the bevel-wheel 5 is secured, this shaft extending downward at the central vertical line of the bed and the car-truck. At its lower end it is provided with a bevel-wheel 7, which engages with a bevel-wheel 8 on a shaft 9, supported on the under side of the truck-frame. The shaft 9 is connected by a chain 10 to one of the car-axles. When one of the clutches 4 connects its wheel 5 to shaft 3, the latter, being in constant rotation, rotates the bevel-wheel 5^a, the vertical shaft 6, the bevel-gearing 7 8, and the car-axle, causing the car, with all of the parts supported thereon, to move bodily along the track. It can be moved in the opposite direction by reversing the clutches at 4 4. After the car has been brought to the desired place for working the clutches are put in their neutral position and the car is held stationary.

In order to adjust the upper bed and the operative parts supported thereon in horizontal planes relative to the truck, the following devices are used:

On shaft 2 there is a sprocket-wheel 11, which drives chain 11^a, the latter engaging

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with the sprocket-wheel 11^b on a shaft 12, mounted just above the bed C. This shaft has two loose bevel-pinions 14, adapted to be connected to the shaft by clutches 14^a, both wheels meshing with the horizontal bevel-wheel 16 on a vertical shaft 15. The lower end of this shaft carries a spur-pinion 17, which meshes with a circular rack 18, the latter being secured rigidly to the car-truck. If the clutches at 14^a 14^a are moved in one direction, the corresponding bevel-wheel 14 causes the parts at 16, 15, 17, and 18 to impart rotation to the bed C and the parts above it, and by throwing the clutches in the opposite direction the other bevel-wheel causes the rotation of the bed in the other way.

After the car-truck and bed have been put in proper places, as above described, the operating mechanisms are actuated as follows:

20 is a sprocket-wheel on shaft 2, connected with a sprocket-wheel 21 on shaft 22 by the chain 20^a.

23 is a spur-pinion on shaft 22, which engages with the wheel 24, there being at 23^a a clutch for connecting and disconnecting the shaft 22 and the spur-pinion 23. The wheel 24 is on the shaft 25, to which are secured two rope-drums 26.

27 is a rope running from each drum up along the inclined bars G, passing over a fixed sheave 30, thence downward to a movable sheave 30^a, thence back to the fixed sheave, and from there again to the movable one. The sheave 30^a is connected by a link to the elevator-frame, and as this frame is suspened from the shaft 29 at the top the ropes, drums, and drum-rotating devices can be used to throw the lower end of the elevator outward and hold it in any desired inclination. The elevator has a frame 28, formed of vertical bars, straight brace-bars, inclined brace-bars, bottom plates, and top plates, all substantially as shown.

The top plates 28^a are provided with tubular bearings, which are fitted upon the journals 28^b, secured to the top frame-bars F. The shaft 29 at the upper end of the conveyer is mounted in the bearings 28^b, this shaft and bearings or journal parts 28^a being supported independently of each other, so that the shaft is free from the strain and pressure caused by the weight of the conveyer-frame.

Power is taken from the shaft 2 by chain 31 to an intermediate shaft 32. This shaft is connected by a bevel-gear at 33 to the shaft 34 of a revolving screen 35. The shaft 32 also has a sprocket-wheel, which is connected by the chain 36 to a wheel 37 on the shaft 29 at the upper end of the elevator. When the shafting and chains are in operation, the elevator chains and buckets will be moved, the buckets loading themselves at the bottom of the elevator with the sand, gravel, or other material that is to be carried. This material is delivered to the chute 38, which discharges it into the interior of the rotary screen 35. Around this screen there is a drum 39, the drum and screen being set at a relatively sharp inclination, so that the materials in them respectively will be advanced toward the lower end and discharged.

The mechanism shown is principally used for elevating sand and gravel and then separating them, and in such case the gravel will be retained in the inner screen and finally delivered at its lower end, while the sand that is separated therefrom and is caught in the outer drum will be separately delivered. The gravel-receptacle is shown at 40 and the sand-receptacle at 41. With the receptacle 40 communicates the extensible and horizontally-adjustable delivery-chute 42, and with the receptacle 41 communicates another to it is adjustably secured the chute 43, these chutes being adapted to deliver the materials which they carry downward to cars, as at 44.

Description has been given above of the manner of swinging outward the lower end of the elevator-frame around the shaft 29 as an axis. When the elevator-frame is being allowed to return toward the main frame, we control its downward movement as follows.

45 is a friction-drum on the shaft 25. 46 is a flexible brake-band surrounding this brake-drum and having its ends connected to a lever 47, the crank-arm 48 of which is connected to a link 49. These parts can be operated in any suitable way. In one mechanism shown in the drawings the link 49 is pivoted to a lever 50, with which a chain 51 is connected, which runs over guide-pulleys 52 and down to a handle-lever 53, accessible to the operator. In the other mechanism illustrated the link is connected to a bell lever 54, which in turn is connected to lever 56 by a link 57.

What we claim is—

1. In an elevating and screening mechanism of the character described, the combination of the wheeled truck-frame, the main frame horizontally adjustable on the truck-frame, the outward-swinging elevator suspended at its upper end from the main frame, the screening mechanism, the power devices on the main frame, power-transmitting devices connecting the power devices with the elevator-chains and with the screening devices, means for detachably connecting the power devices to the elevator-adjusting devices, reversible power-transmitting devices for detachably connecting the power devices to the truck-wheels, and reversible power-transmitting devices for detachably connecting the power devices to the means by which the main frame is adjusted axially, substantially as set forth.

2. In a portable elevating and screening mechanism, the combination of the wheeled truck-frame, the main frame thereon, the outward-swinging elevator suspended at its upper end from the main frame, the screening mechanism, the power devices on the main frame, the power-transmitting devices connecting the power devices with the ele-

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325-327

vator-chains and with the screening devices, means for detachably connecting the power devices to the elevator-adjusting devices, and means for controlling at will the inward swinging of the elevator-frame, substantially as set forth.

3. In an elevating and screening mechanism, of the character described, the combination of the wheeled truck-frame, the main frame hereon, the outward-swinging elevator extended at its upper end from the main frame, the screening mechanism, the power devices on the main frame, power-transmitting devices connecting the power devices with the elevator-chains and with the screening devices, the horizontally and vertically adjustable chutes, one for the tailings of the screen and one for the material which passes radially from the screen, and means for adjusting the screening mechanism bodily horizontally relatively to the truck-frame, substantially as set forth.

RANKIN L. SHOEMAKER.
FREEMAN R. WILSON, Jr.

Witnesses:
C. A. Dodds,
Robt. H. Jeffrey.

735

328

No. 694,579. Patented Mar. 4, 1902.

E. L. RANSOME.

SELF DUMPING HOIST.

(Application filed July 17, 1901.)

(No Model.)

FIG. 1.

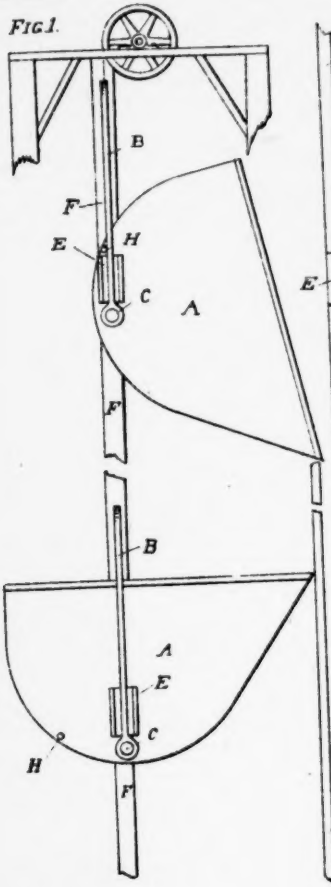


FIG. 2.

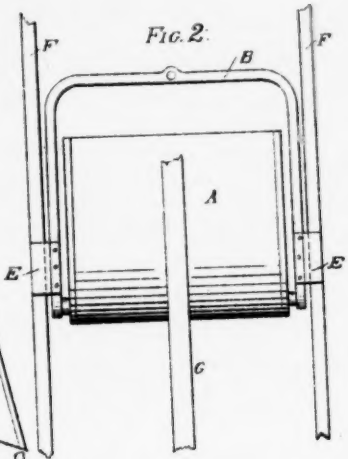
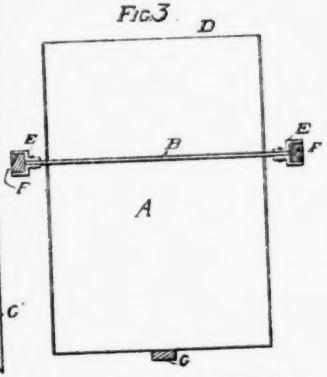


FIG. 3.



WITNESSES

George T. Allen.

John Ellendt.

INVENTOR

Ernest Leslie Ransome.

329-331

UNITED STATES PATENT OFFICE.

ERNEST LESLIE RANSOME, OF NEW YORK, N. Y.

SELF-DUMPING HOIST.

SPECIFICATION forming part of Letters Patent No. 694,579, dated March 4, 1902.

Application filed July 17, 1901. Serial No. 68,703. (No model.)

To all whom it may concern:

Be it known that I, ERNEST LESLIE RANSOME, a citizen of the United States, residing at the city of New York, in the State of New York, have invented an Improved Self-Dumping Hoist; and I hereby declare the following to be a full, clear, and exact description of the same.

My improvement relates to that class of hoists that are used for elevating materials vertically—as, for example, material used in the erection of a building or mineral out of a mine.

It consists of a tub, the bail of which slides upon guides, while the tub is sustained in the required vertical position by a bar against which it slides and over which it turns and discharges.

The accompanying drawing illustrates my invention, in which—

Figure 1 is a side view of the hoist in two positions with one guide removed. Fig. 2 is a front view. Fig. 3 is a plan.

A is the tub.

B is the bail; C, the trunnions.

D is the rear of the tub.

E E are slides on the bail.

F F and G are fixed guides, and H is a stop.

My invention is as follows: Any suitable tub A is hung on the handle of bail B upon trunnions C, which are placed well below the center of gravity of the tub and to the rear thereof in such a manner that when hung the tub by its own gravity falls forward either when empty or full. The bail is held by slides E to the fixed guides F in such a manner that the tub can freely slide up and down between them. Bar G is fixed in front of the discharge side of the tub and at such a distance from the line of the guides F as to sustain the tub in a vertical position right side up. This bar extends to the height of the required lift. Bar G may be divided into as many sections as necessary, and by adding or removing one or more sections the height of the tub can be regulated roughly. For a closer regulation one bar may be lapped past another, as shown at G'. In operation, the weight of the tub being mostly forward, as it is hoisted it bears against the bar G and slides upon it until the top thereof is reached, when as it is raised higher it turns upon the bar G until it becomes sufficiently inverted to discharge its contents. The tub is then lowered, and as it falls it returns back upon the bar G and resumes its first position. The tub can be hoisted by any convenient means. Stop H prevents the tub from overturning too far.

Instead of attaching the bail to the fixed guides the tub may be attached by its trunnions or in any other convenient manner that will permit of free movement up and down.

The tub is hoisted and the fixed guides are held in place by any suitable means.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A hoisting-tub swung on a bail wherein it overturns by its own weight, in combination with fixed guides upon which the bail moves, a stop to prevent the tub from overturning too far, and a guide-rail in front of the tub which retains the tub in position and upon the top of which the tub tips, substantially as described.

2. The hoisting-tub A swung in the bail B in combination with fixed guides F and the guide-bar G, substantially as described.

ERNEST LESLIE RANSOME.

Witnesses:
JOHN ELLENDT,
GEORGE T. ALLEN.

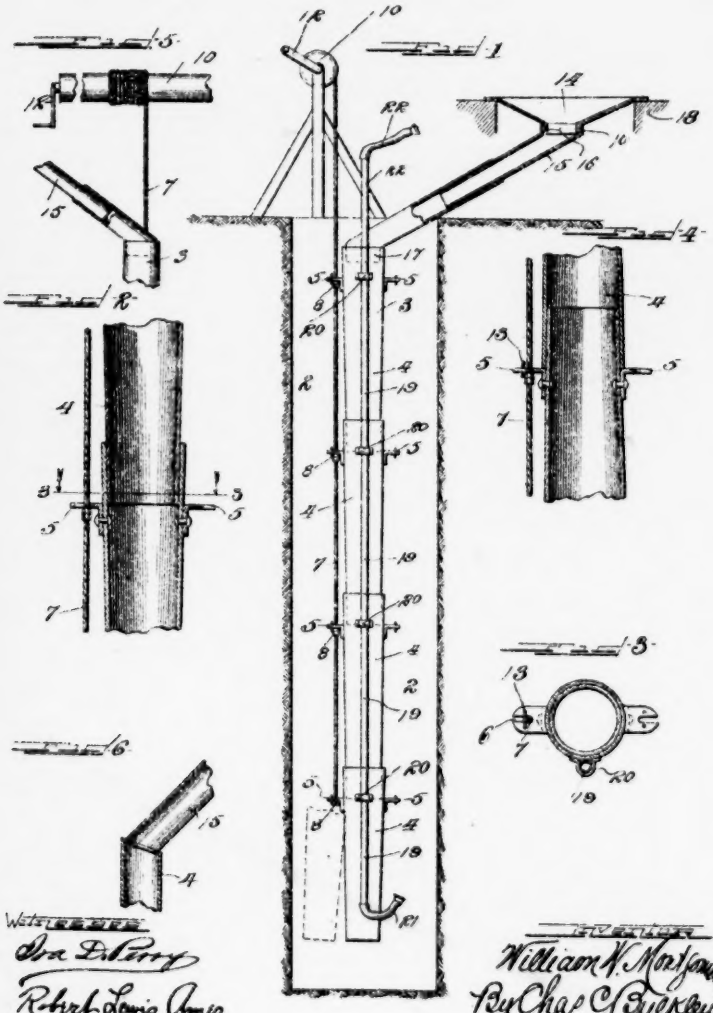
No. 702,372. Patented June 10, 1902.

W. W. MONTGOMERY.

CONDUCTOR FOR CONCRETE.

(Application filed May 27, 1901.)

(No Model.)



Witnesses:
Ira DeLong
Robert Lewis Ames.

Inventor:
William W. Montgomery
By Chas C. Buckley
Atty

333

UNITED STATES PATENT OFFICE.

WILLIAM W. MONTGOMERY, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO THOMAS H. MONTGOMERY, OF CHICAGO, ILLINOIS.

CONDUCTOR FOR CONCRETE.

SPECIFICATION forming part of Letters Patent No. 702,372, dated June 10, 1902.

Application filed May 27, 1901. Serial No. 62,024. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. MONTGOMERY, a citizen of the United States of America, and a resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Conductors or Conveyers for Concrete, Cement, and the Like, of which the following is a specification.

My invention relates to apparatus for conveying concrete, cement, mortar, and like material to the bottom of excavations, caissons, pits, and other similar inaccessible places. It has been customary heretofore to lower such materials by means of buckets and windlasses or by other hand devices; but such methods are slow, laborious, and expensive, besides being otherwise unsatisfactory.

It is the object of my invention to provide a means or apparatus for overcoming the above-stated objections and to accomplish the results sought in a simple, inexpensive, and efficient manner.

In carrying out my invention I provide a conveyer or conductor consisting of a pipe, tube, or spout composed of a plurality of similar sections adapted to be supported by a cable, wire, rope, chain, or like means from a hoisting apparatus, as a windlass, at the surface of the ground and to reach from the surface to the bottom of the pit, caisson, or excavation. Means, such as a funnel, is provided for the topmost section to enable the cement or other material to be readily poured, shoveled, or otherwise directed into the spout or conveyer. The sections enable the conveyer to be used at any depth, to be readily lowered or raised, and to not be unwieldy in storing or in moving from place to place. Being suspended from above, the pipe or conveyer may be easily swung about in any direction to direct the cement or other matter to any desired point in the pit or excavation, this being more readily accomplished by a workman at the bottom. It often becomes desirable or necessary in such work to communicate between the bottom of the caisson or pit and the surface of the ground, and more or less inconvenient methods have been adopted for the purpose; but in my invention I propose to arrange for this by attaching sections of a speaking-tube to the sections of the conveyer, so that when the tube is built up a speaking-tube from the bottom to the top is also completed, through which conversation may readily be held whenever desired.

The invention further comprises the novel construction, parts, and combinations of parts hereinafter described, and further pointed out in the appended claims, reference being had to the accompanying drawings, forming a part hereof, in which the same reference characters designate like parts throughout the several views, and in which—

Figure 1 is a side elevation of the invention, showing it reaching to the bottom of an excavation. Fig. 2 is an enlarged longitudinal sectional view through one of the joints of the sections. Fig. 3 is a cross-sectional view on the line 3 3 of Fig. 2. Fig. 4 is a view similar to Fig. 2 of a modification. Fig. 5 is a view of a modified funnel, spouts, and arrangement. Fig. 6 is another modification of the spout and sections.

In the figures the numbers 2 designate a pit or excavation of some sort extending some distance below the surface of the ground. It may not have the regular outlines shown, as the drawings are only intended to represent diagrammatically a deep hole in the earth, at the bottom of which it is desired to use concrete, cement, or like material. The invention may be used in any similar relation, as in the construction of bridge or other foundations built under water with or without caissons, or wherever it is desired to lower such material from one elevation to another.

The conveyer 3 comprises the individual sections 4, which are preferably made of heavy sheet-iron of sufficient thickness to withstand the particular work required of it and are slightly larger at the top than at the bottom, so that the lower end of one section will fit within the upper end of the next lower section, and so on, the overlapping portions being uniform or the same at each joint and sufficient to constitute a good connection. Each section is provided, preferably near its upper end, with lugs or ears 5, riveted or otherwise secured to said sections and similarly located on each section, the said ears or lugs being slotted, as at 6 in Fig. 3, for the reception of the supporting-cable 7, which

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is provided with enlargements 8, such as stop-bolts, beneath each lug or ear 5, so as to prevent it from slipping through the slots of the ears or lugs 5. The cable extends to the surface of the ground through the said slots of the lugs on each and all of the sections of the conductor or conveyer and is wound upon the windlass 10, journaled in suitable bearings or supports 11 on each side of the opening of the excavation 2 and is adapted to be rotated by a crank 12 or other desirable means to raise and lower the said conveyer or conductor to the desired extent. The cables may be retained in the slots 6 by any suitable latch device, as the staple 13, adapted to be inserted through the apertures provided therefor in the ears or lugs 5, so that the cable 7 will not escape from the slots 6. It will thus be noticed that the entire weight of the conductor 3, as well as that of each section 4, is carried upon the cable 7 and that the sections are also laterally supported by the cable through the medium of the ears 5.

In order to conveniently pour the concrete or like material into the top of the conductor or conveyer 3, a hopper or funnel 14 is provided and is connected with the top of the tube 3 by means of the spout 15. The hopper 14 is preferably square in outline for ease in constructing a platform or runway about or along one side of it, upon which runway or platform the material can be wheeled and dumped into the hopper 14. The spout 15 is capable of a slight rotation about the collar or neck of the hopper by means of the rivet-and-slot connection between them to allow for the sidewise travel of the conveyer 3 as the cable unwinds from or is wound upon the windlass. The lower end 17 of the spout is preferably given a downward bend to cause it at all times to stay in the top of the conductor 3 and to permit such sidewise movement. The said spout is preferably telescopic, as shown in Fig. 1, to permit its necessary elongation and contraction during such movement of the conductor 3.

In the modification of Fig. 5, where the spout 15 is in a vertical plane parallel to a similar plane through the windlass, only the means for lengthening and shortening the spout need be provided, since the rotation of the parts is eliminated. Either arrangement could be adopted. Again, as in Fig. 6, the upper ends of the sections could be cut on a slant, so that a larger spout 15 and one without the downward curve 17 could be employed.

In lowering the device into the excavation the cable is first attached in the ear 5 of the lowest or first section, which is lowered a slight distance, and the next section placed in position, with its lower end on top of the other section and with the cables 7 in slots 6 of its ears or lugs 5, which sections are then lowered and another section added, and so on until the bottom of the pit, excavation, or caisson is reached. The funnel or hopper 14, which, as stated, is suitably supported by a framework, (indicated at 18,) is connected by means of the spout 15 with the top of the last section of the tube or conveyer, all the joints and connections of the hopper with the conveyer being sufficiently loose and free to permit such connection in an easy and convenient manner. The concrete may now be thrown or poured into the hopper 14, and will run down the spout 15 into the conveyer 3. As the whole tube 3 is suspended from a single cable, its lower end may be swung about as desired, as indicated in dotted lines in Fig. 1, to direct the falling matter to any desired point to distribute evenly or as preferred. The device may be raised to any extent as the excavation fills, or when it is desired to entirely remove it from the pit, the spout 15 being first withdrawn and the sections 4 being removed as the tube is raised. The windlass is of course provided with means to sustain the tube at any elevation. In the modification in Fig. 4 the sections appear in the reverse direction, the upper end of the lower section being inserted in the end of the section above. In this case the upper sections could rest directly upon ears or lugs 5 of the next lower section. The double set of ears 5 may not be necessary, but are provided for convenience in case the other ears give out or it becomes necessary to suspend the tube from the other side.

In order to communicate between the lower end of the pipe and the upper end, I provide each section 4 of the conveyer 3 with corresponding sections 19 of a speaking-tube, which may be secured to the sections 4 by strips 20 or in any other desired manner. When the sections 4 are placed together, the sections 19 of the speaking-tube will be joined together and form a continuous tube from the top to the bottom of the pipe. The lower section 4 of the conveyer may have this tube provided with an extension 21, which may be flexible, as indicated, or otherwise in order that it may be conveniently spoken into. The branch 21 may extend from any portion of the section near the top, bottom, or midway therebetween or may be taken off from the tube of the section above, according to the positions most convenient. The upper end of the tube may also be fitted with an extension 22, similar to the one at its lower end, only longer, and which likewise may be flexible and used at any desired angle. This extension will preferably be removable, so that it may be inserted in the upper end of the tube of the last conveyer-section. It will also be understood that these extensions 21 and 22 are mere matters of convenience and may not be used at all, simply the open ends of said tubes 14 being depended upon for conversational purposes.

While the exact dimensions are not of the essence of my invention, I have found that sections about four feet long, seven and one-half inches in diameter at the bottom, and enough larger at the top to make a good tele-

scoping connection with the next section are convenient of manipulation and efficient for the purpose of conveying cement or concrete to the bottom of deep excavations. The hopper may be three feet square, and all the parts should be located, proportioned, and arranged to readily and conveniently accomplish the purposes intended.

So far as some features of my invention are concerned, the special form and arrangement of hopper and spout is immaterial, for any kind that will accomplish the work may be used. Two cables, one on each side, may be employed, if necessary or preferred; but one is more satisfactory, as easily allowing the lower end of the conveyer to be swung about in any desired direction. The rope or cable may, if preferred and so far as some of my claims are concerned, have stop bolts or pins or other enlargements below the ear or lug of the lowest section only; but in this case the entire weight of the pipe will be borne by such lug or section, and the others would only derive lateral support from the cable. I prefer, however, the construction shown and described. Wherever the term "cable" is used in the claims it is intended as a generic word to cover any like means, as a wire, rope, chain, &c.

The iron of which the sections of the conveyer are made may be galvanized to guard against rust.

It will be observed that an important feature lies in so connecting the sections of the conveyer that they may be detached independently, whereby the conveyer may be lengthened or shortened by attaching additional sections or removing one or more of the attached sections. By this arrangement the sections may all be made of the same size and of a minimum diameter. It will be noted also that the joints between the sections are closed tight and that they are rigid—*i. e.*, non-flexible—so that in moving the conveyer about in the excavation the entire conveyer moves bodily. The rigid but detachable joints between the joints are most conveniently formed by tapering the sections, so that the smaller end of each will partially telescope into the larger end of the adjacent section and make a rigid close joint therewith; but it is obvious that any other means for making a detachable joint may be resorted to without departing from the invention.

Although I have described the invention with particular reference to the details of construction, I would have it understood that it is not to be limited thereto, as various changes, alterations, modifications, and substitutions may be made therein and still come within its purview; but

What I do claim, and desire to secure by Letters Patent, is—

1. In an apparatus of the class set forth, the combination of a conveyer consisting of a series of hollow cylindrical sections telescoped partially into each other at their adjacent ends and having rigid, close joints at each of said telescopic connections, a supporting-cable detachably attached to each of said sections, means for raising and lowering said supporting-cable and the attached conveyer, and means detachably connected to the topmost section for introducing the material to be conveyed into said topmost section, whereby the conveyer may be swung about at its lower end without pivotal or telescopic action at the joints and may be extended by the addition of sections to or shortened by the removal of sections from the upper end of the conveyer.

2. In an apparatus of the class described, the combination of a conveyer consisting of a series of hollow cylindrical sections having the same diameter and tapered to telescope partially into each other at their adjoining ends, these joints being rigid but detachable, a supporting-cable attached to the lowermost section of the conveyer and adapted thereby to support the entire conveyer, means for detachably connecting the remaining sections to the cable, whereby said sections may be removed one by one from the upper end of the conveyer as the conveyer is bodily raised, means for bodily raising and lowering the conveyer, and a hopper having a spout detachably connected to the topmost section of the conveyer, for the purposes set forth.

3. In an apparatus of the class set forth, the combination of a conveyer consisting of a series of hollow cylindrical sections detachably connected together and having closed rigid joints at their adjoining ends, a supporting-cable and means for connecting it to the lowermost section and detachably to the remaining sections, means for raising and lowering said cable and the attached sections, and means detachably connected to the topmost sections for depositing the material to be conveyed thereinto, for the purposes set forth.

4. In a device of the class described, the combination with a conveyer composed of separate sections, with telescoping joints, a slotted ear on each section, a cable passing through the slots of all the ears, a latch on each ear to confine the cable in the slot, means such as an enlargement of the cable beneath the several ears to prevent the same from drawing through said ears, and a windlass upon which the cable may be wound to raise and lower the conveyer.

5. In a device of the class described, the combination, with a conveyer composed of separately-detachable sections rigidly connected together and having their ends telescoped into each other to make a tight joint and enable the conveyer to be shifted bodily laterally and vertically, means for raising and lowering the conveyer, and means for depositing the material to be conveyed into the upper end of the conveyer.

6. In a device of the class described, the combination with a conveyer composed of independently detachable and attachable sections, a spout fitting into the top of the upper section, a hopper connected with the other end of the spout, a cable supporting said conveyer, a windlass or drum about which the said cable is wound to hoist or lower the conveyer, and means to permit said spout to fit within the said top section of the conveyer in the different positions of the conveyer determined by the wrapping of the cable upon, or its unwrapping from, the said windlass or drum.

7. In a device of the class described, the combination with a conveyer composed of independently-detachable partially-telescoped sections, a spout fitting into the top section, a hopper connected with the other end of the spout, a cable supporting said conveyer, a drum about which the said cable is wound to hoist or lower the conveyer, said spout being made extensible by telescoping sections and provided with a rotatable connection with the hopper.

8. In combination with a series of depending supporting-sections detachably connected together, means for raising and lowering said sections and supporting them, of sections of a speaking-tube secured respectively to the sections of said support and adapted to register and connect when said supporting-sections are put together, as and for the purposes set forth.

9. In a device of the class described, the combination with conveyer-sections having slotted lugs or ears, speaking-tube sections secured to said conveyer-sections in similar relation to the said lugs or ears, a cable passing through said lugs or ears to support the conveyer-sections, the said tube-sections registering with each other when the conveyer is so built up.

Signed by me at Chicago, Cook county, Illinois, this 25th day of May, 1901.

WILLIAM W. MONTGOMERY.

Witnesses:
MARY MCFATRICH,
THOMAS H. MONTGOMERY.

CLOSE IN CENTER

338–339

No. 714,150

Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 26, 1901.)

(No Model.)

31 Sheets—Sheet 1.

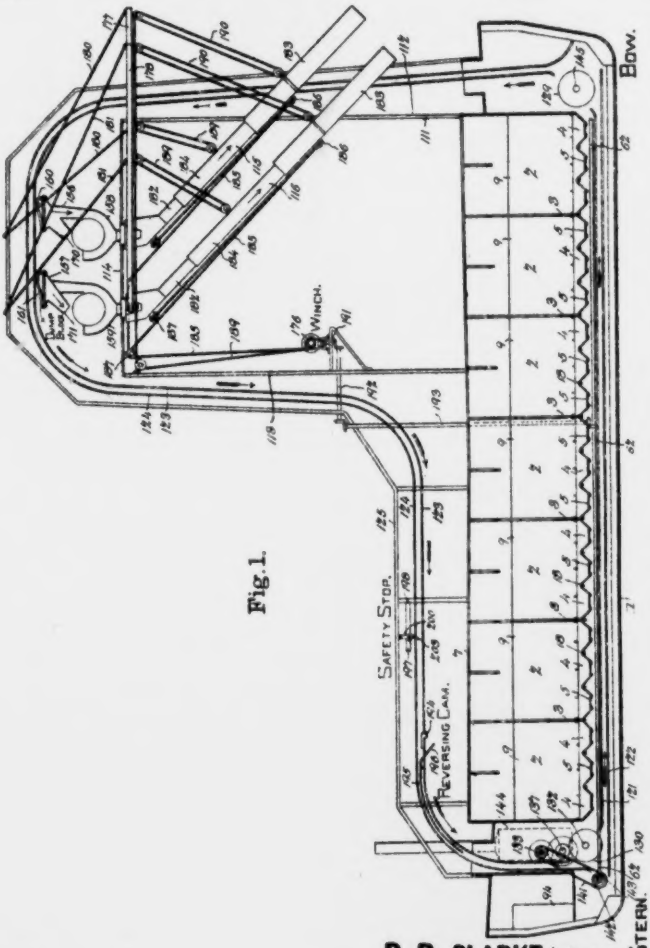


Fig. 1.

Witnesses
E. F. Stewart.
H. F. Riley

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340–341

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 26, 1901.)

(No Model.) 31 Sheets—Sheet 2.

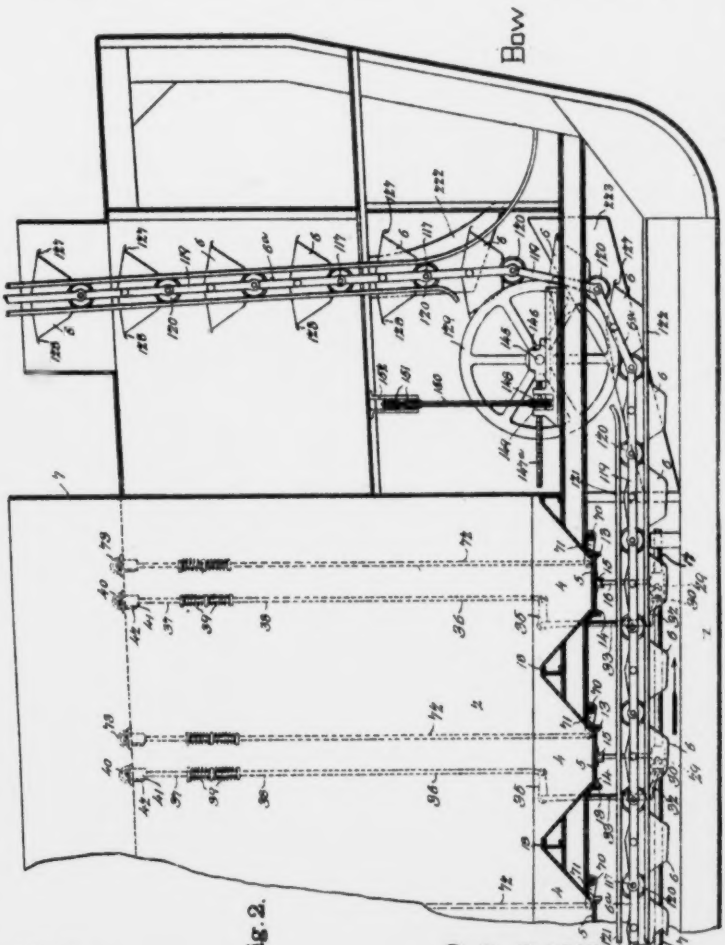


Fig. 2.

Witnesses
E. F. Stewart
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342-343

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 26, 1901.)

(No Model.) 31 Sheets—Sheet 3.

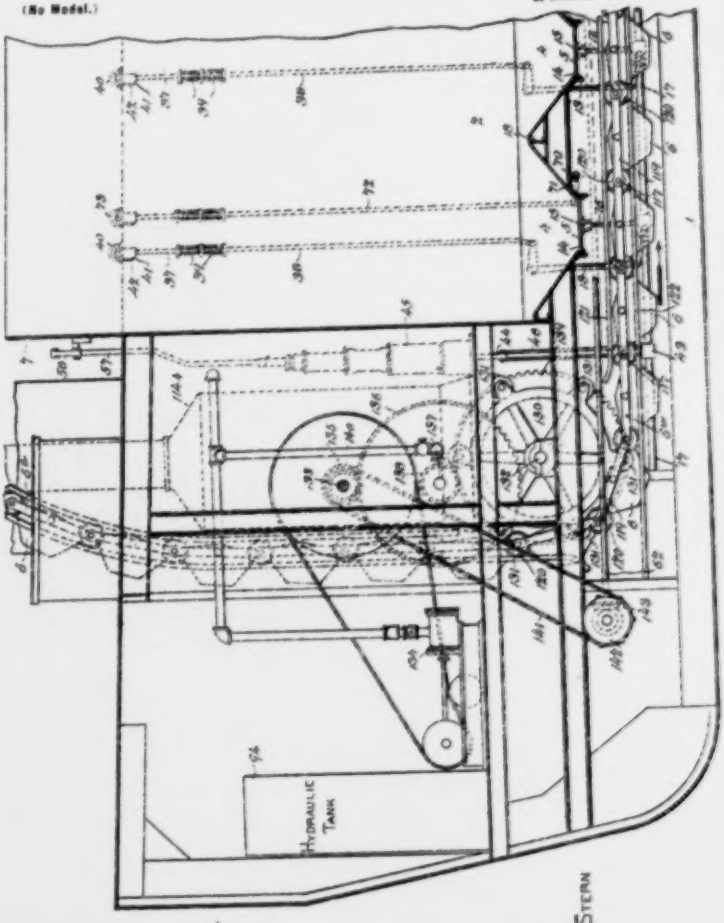


Fig. 3.

Witnesses
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344-345

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 28, 1901.)

(No Model.) 31 Sheets—Sheet 4.

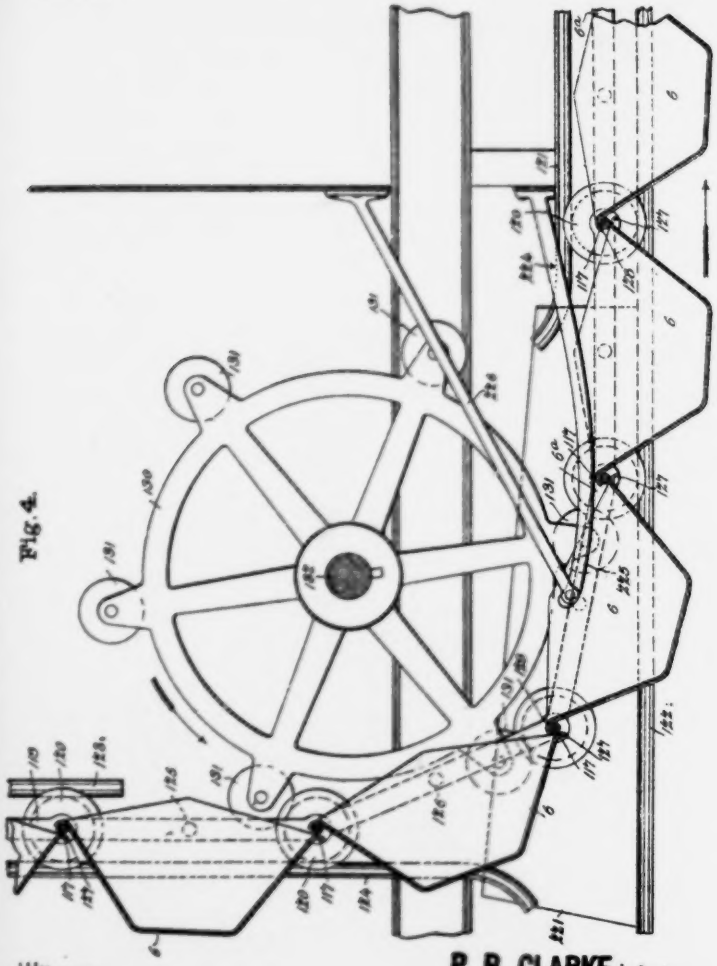


Fig. 4.

Witnesses

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346

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No. 714,150. Patented Nov. 25, 1902.

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APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 28, 1901.

(No Model.) 31 Sheets—Sheet 5

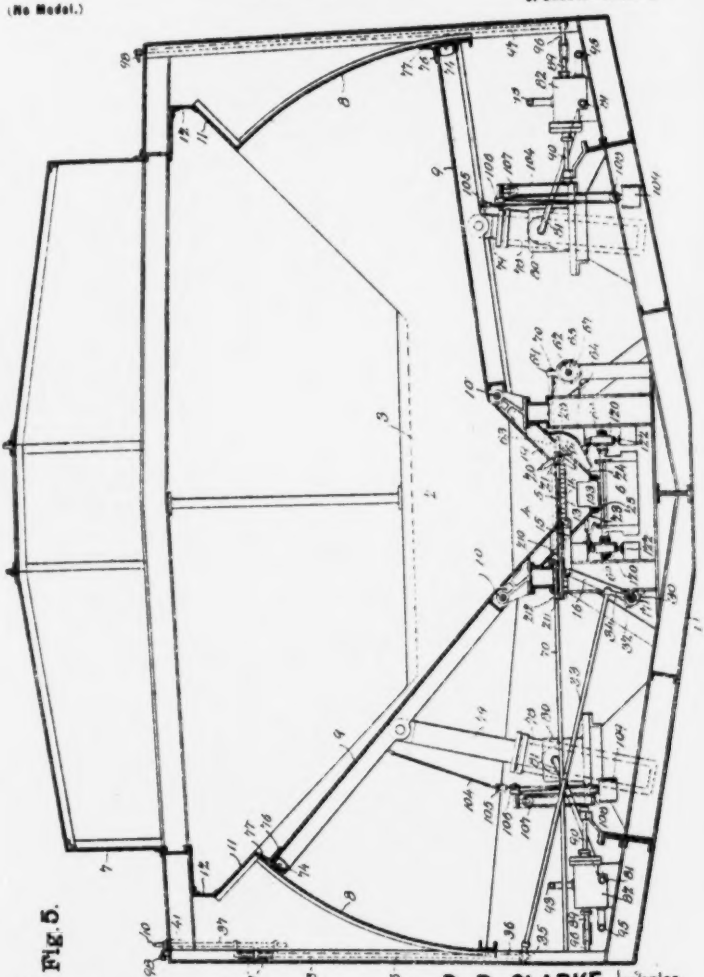


Fig. 5.

Witnesses
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348-349

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 26, 1901.)

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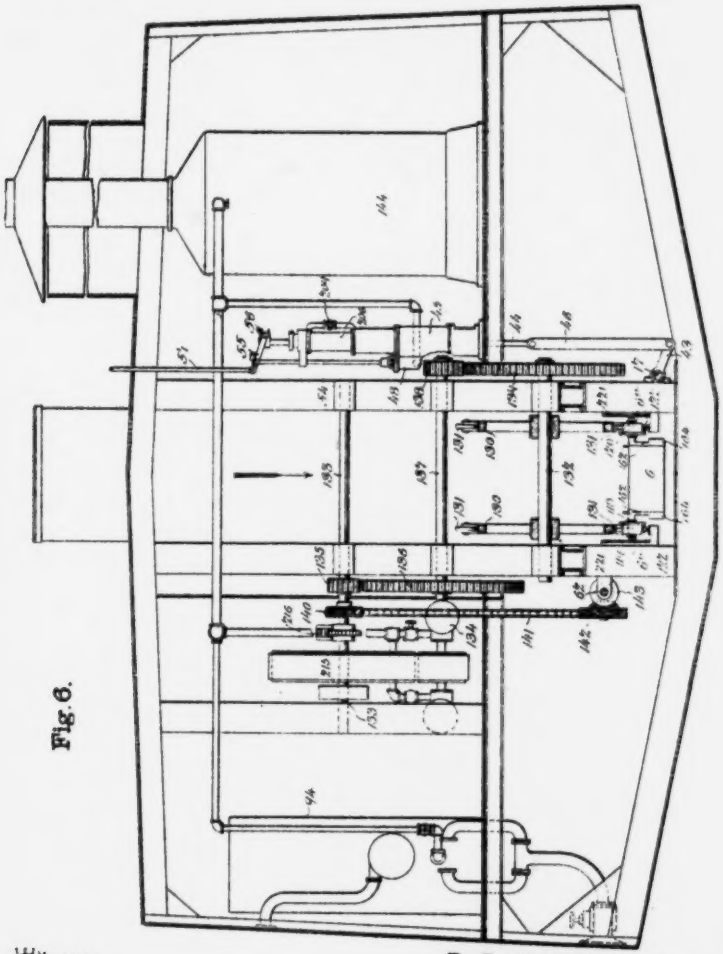


Fig. 6.

Witnesses
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748

350–351

No. 714,150

Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan 26, 1901.

(No Model.)

3 Sheets—Sheet 7

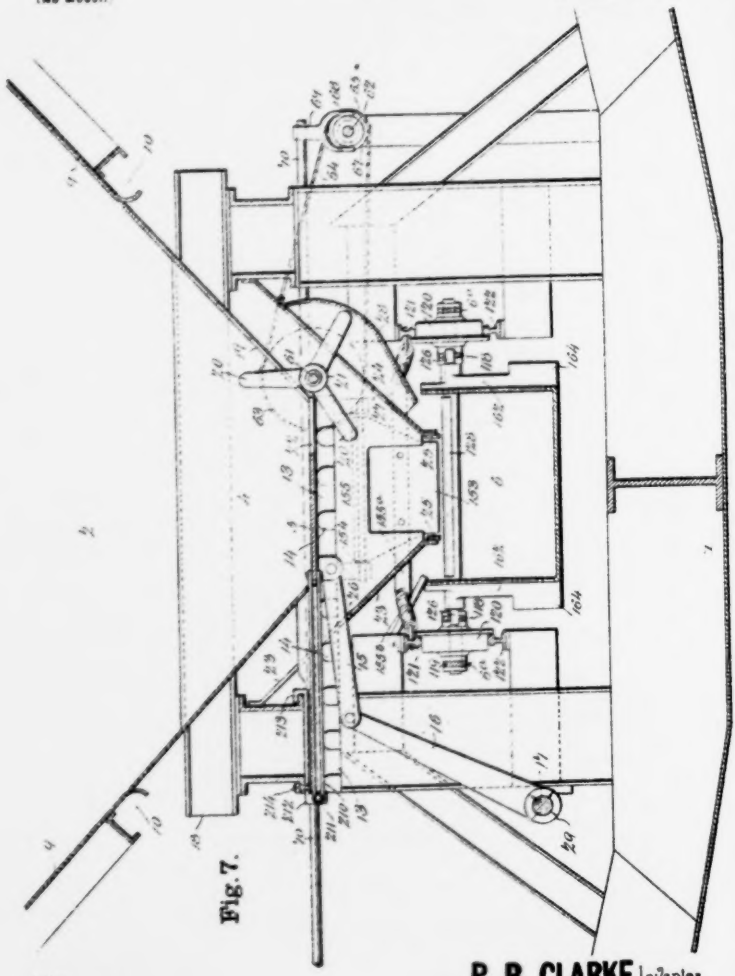


Fig. 7.

Witnesses

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729

352–353

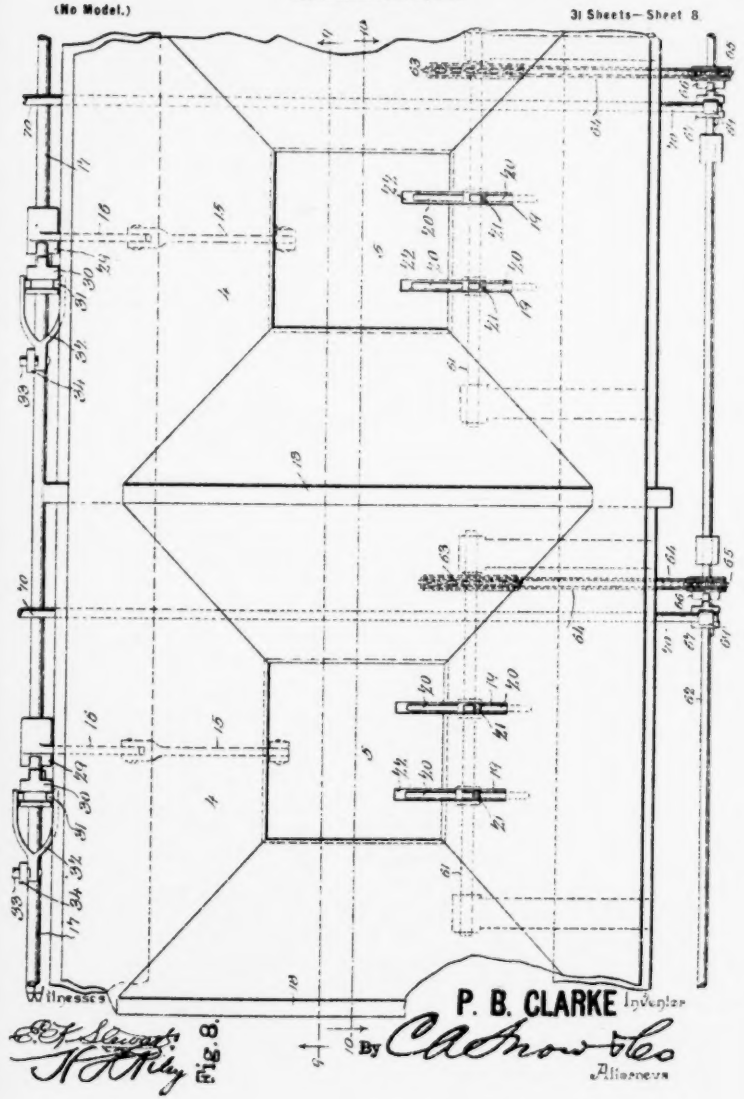
No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 28, 1901.

(No Model.) 31 Sheets—Sheet 8.



Witnesses

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Fig. 8.

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354-355

No. 714,150. Patented Nov. 25, 1902.

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APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 26, 1901.

(No Model.) 31 Sheets—Sheet 9.

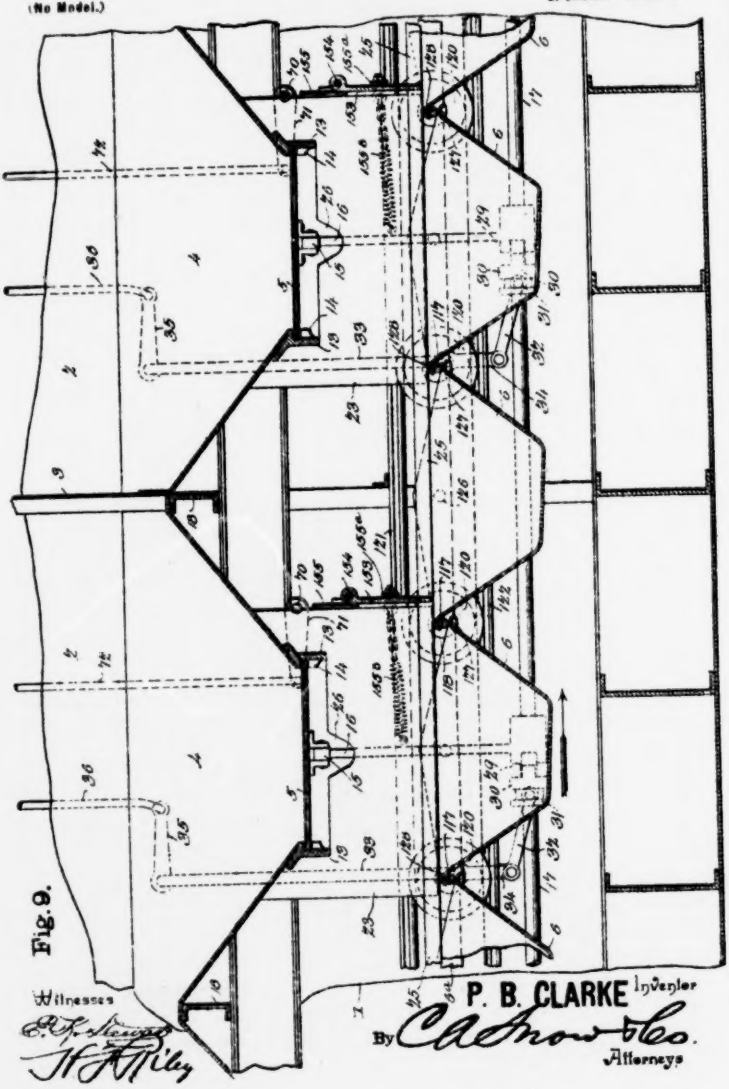


Fig. 6.

Witnesses
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356-357

No. 714,150. Patented Nov. 25, 1902.

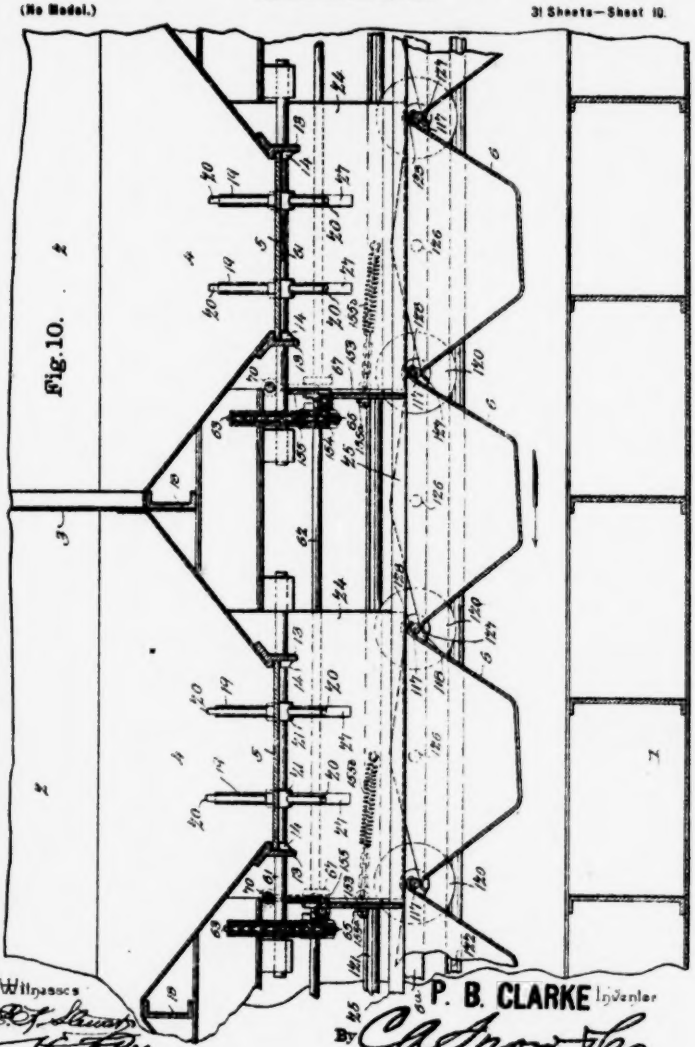
P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 28, 1901.)

(No Model.) 31 Sheets—Sheet 10.

Fig. 10.



Witnesses:
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752

358–359

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 28, 1901.)

(No Model.) 31 Sheets—Sheet 11.

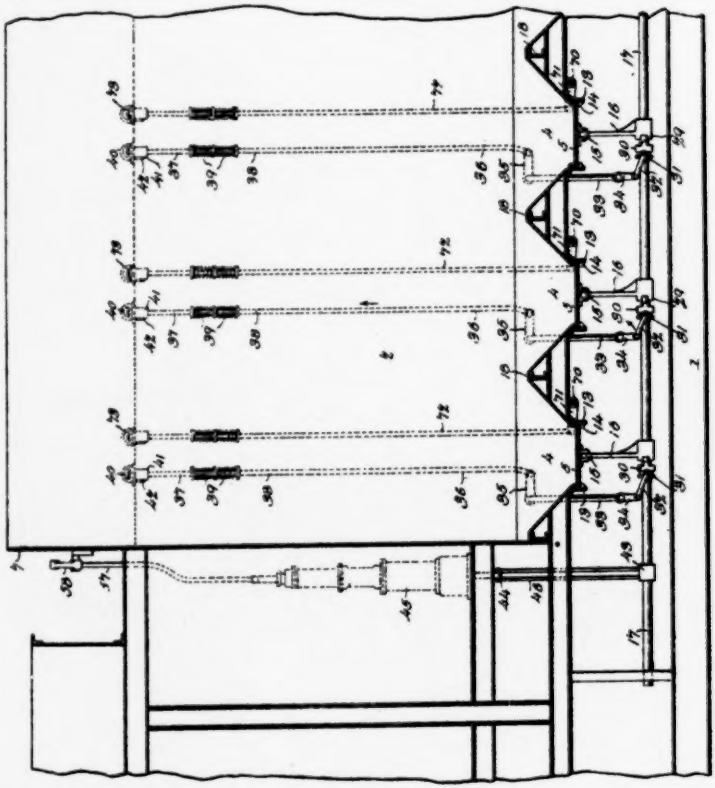


Fig. 11.

Witnesses
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753

360–361

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 26, 1901.)

(No Model.) 31 Sheets—Sheet 12.

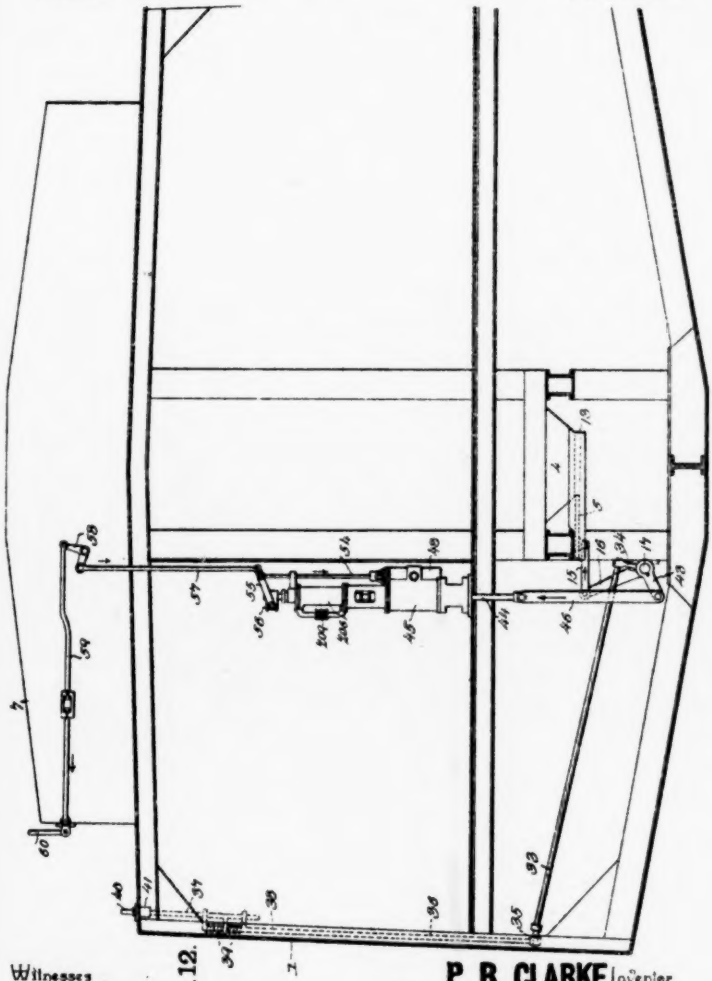


Fig. 12.

Witnesses
R. F. Gaynor
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754

362-363

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK

Application filed Jan. 26, 1901.

(No Model.) 31 Sheets—Sheet 13.

Fig. 13.

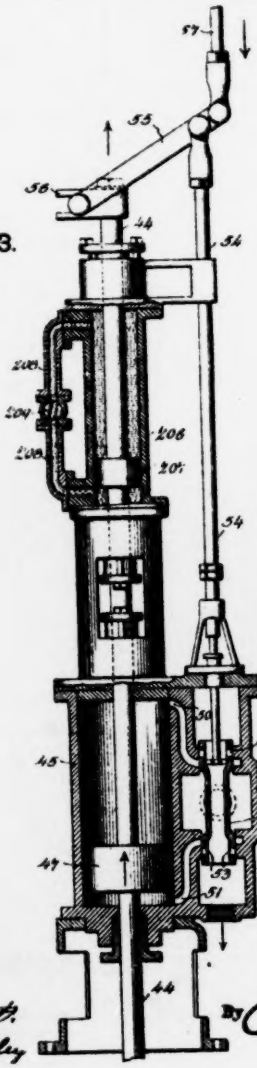
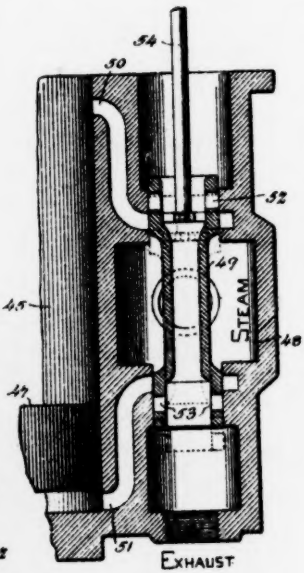


Fig. 14.



Witnesses
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364-365

No. 714,150. Patented Nov. 25, 1902.

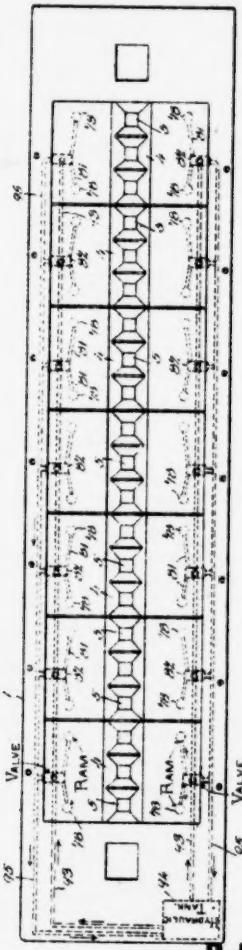
P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 26, 1901.

(No Model.) 31 Sheets—Sheet 14.

Fig. 15



Witnesses
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366-367

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APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 26, 1901.

(No Model.) 31 Sheets—Sheet 15.

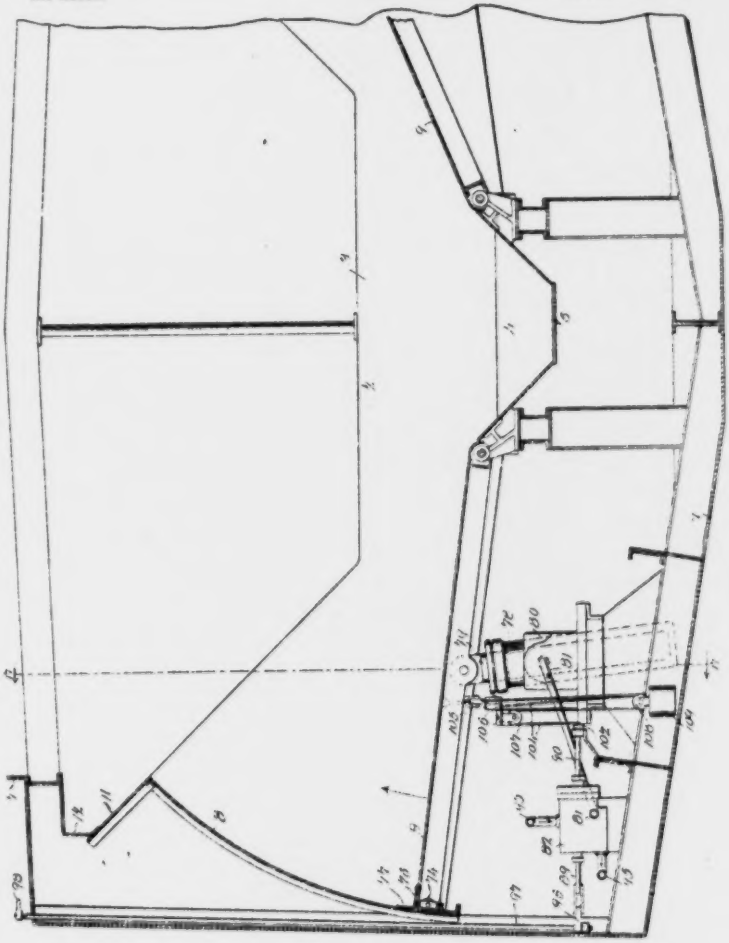


Fig. 16.

Witnesses
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368-369

No. 714,150 Patented Nov. 25, 1902.

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APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 20, 1901.

(No Model.) 31 Sheets—Sheet 16.

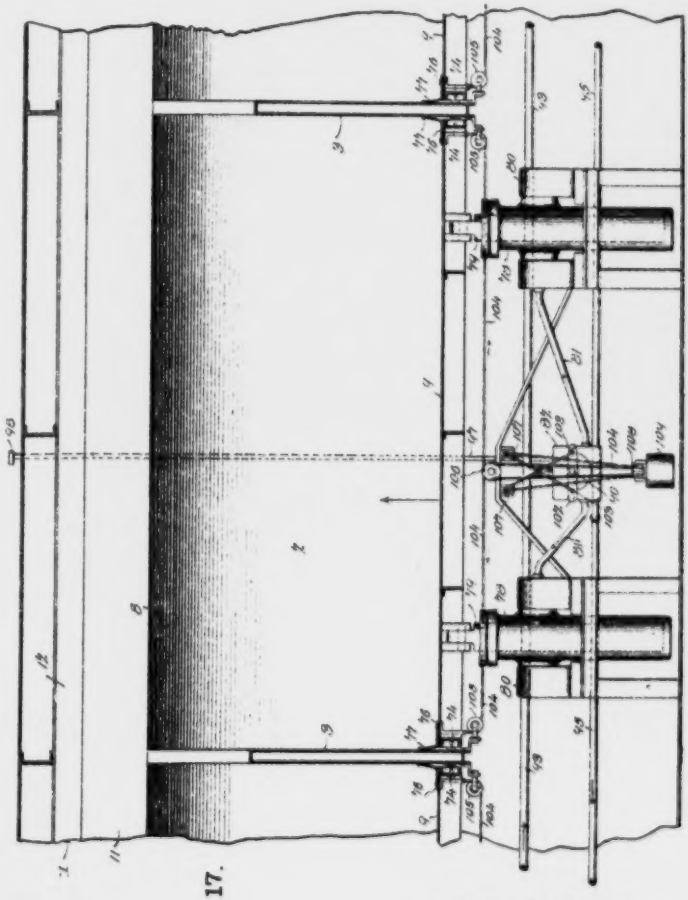


Fig. 17.

Witnesses
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370-371

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 28, 1901.)

(No Model.) 31 Sheets—Sheet 17.

Fig. 19.

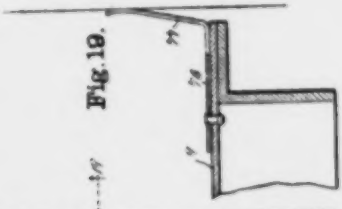
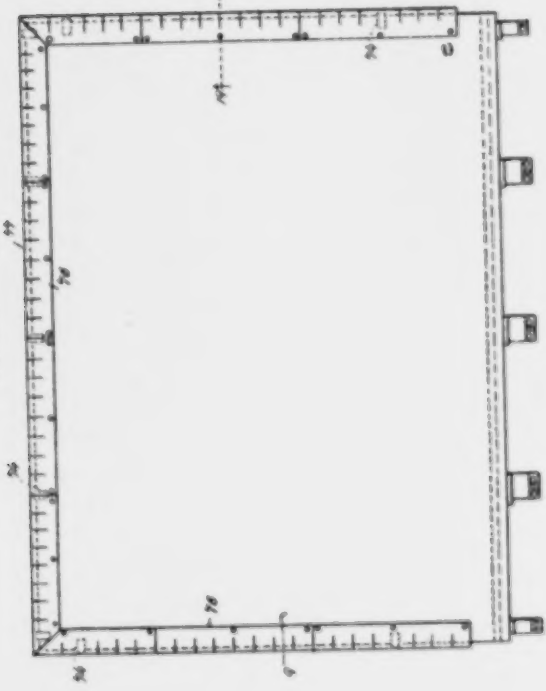


Fig. 18.



Witnesses
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259

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No. 714,150 Patented Nov. 25, 1902.

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APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 26, 1901.

(No Model.)

31 Sheets—Sheet 18

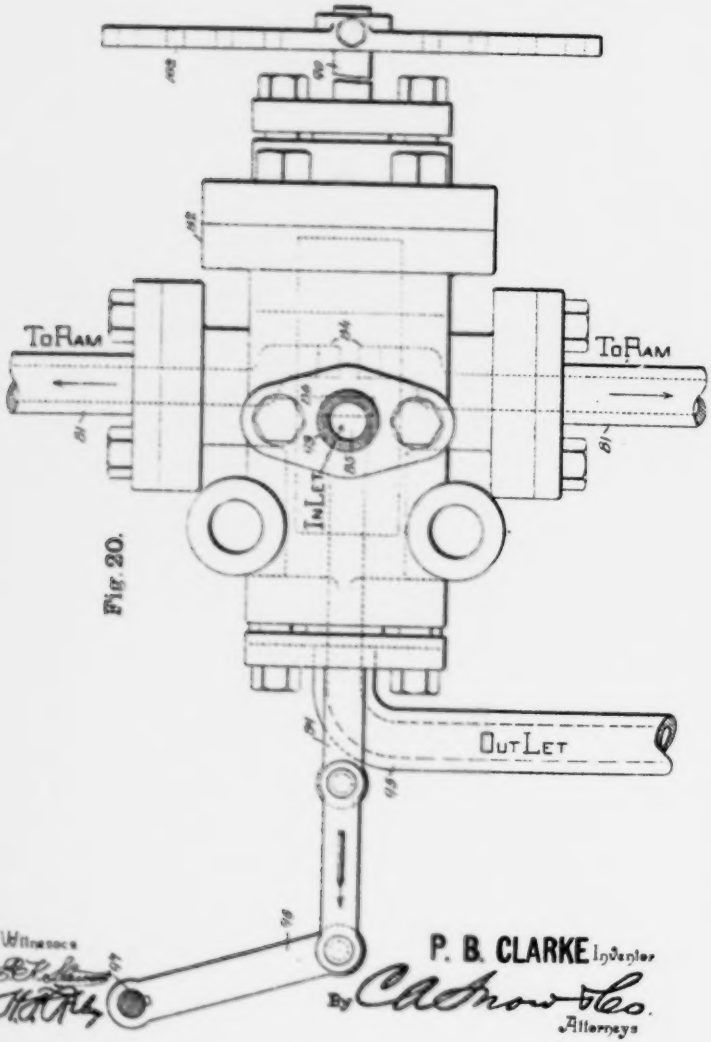


Fig. 20.

Witnesses

P. B. CLARKE Inventor

By Cachow & Co.

Attorneys

760

374-375

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 26, 1901.

(No Model.) 31 Sheets—Sheet 19.

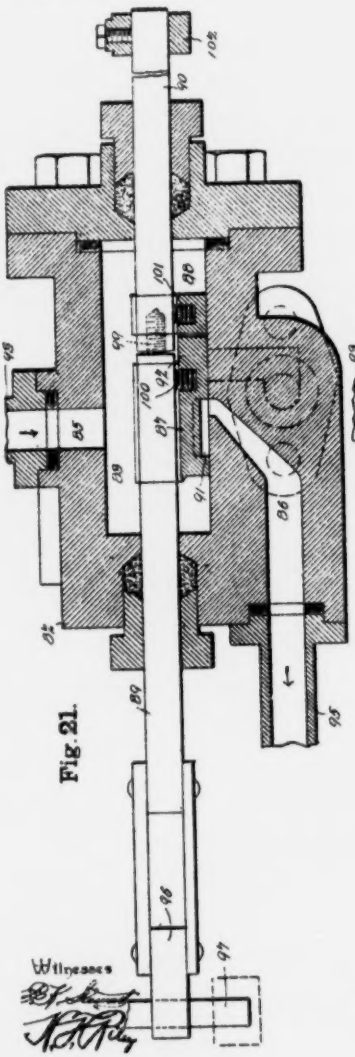


Fig. 21.

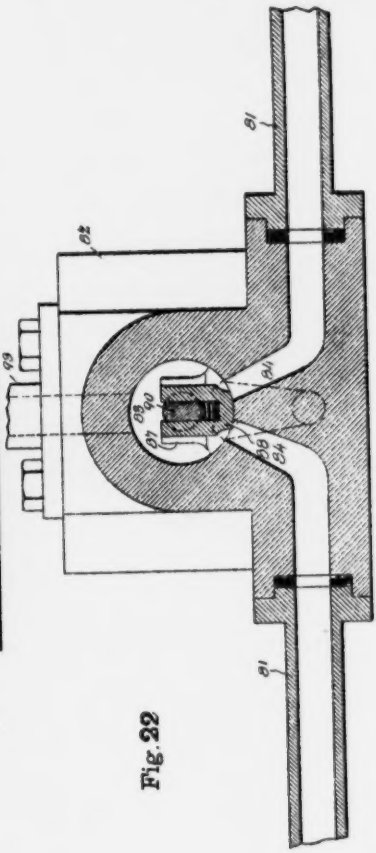


Fig. 22.

Witnesses

P. B. CLARKE Inventor

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761

376-377

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATE L IN BULK.

(Application filed Jan. 26, 1901.)

(No Model.) 31 Sheets—Sheet 20.

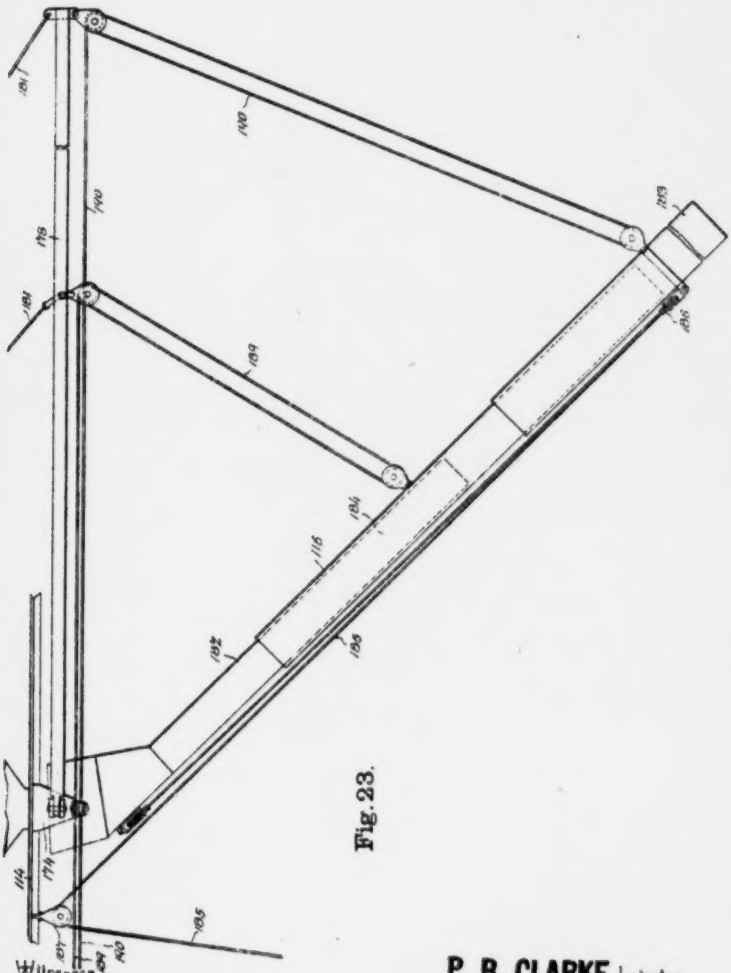


Fig. 23.

Witnesses:
E. F. Stewart
H. J. Riley

P. B. CLARKE Inventor
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762

378–379

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 28, 1901.

(No Model.) 31 Sheets—Sheet 21.

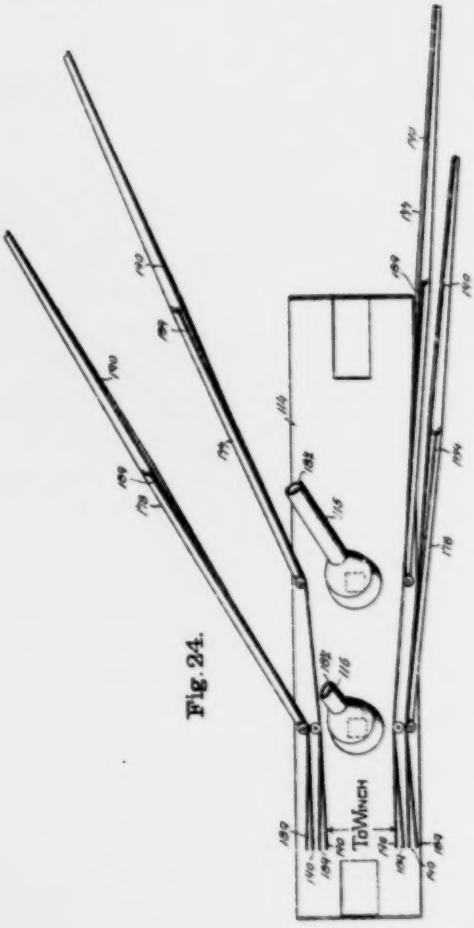


Fig. 24.

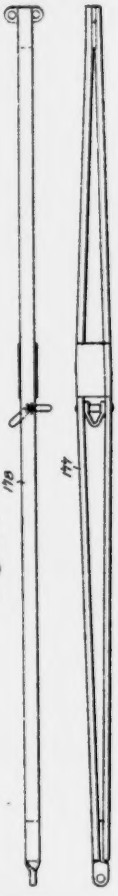


Fig. 25.

Fig. 26.

Witnesses
C. Pickard
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768

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 26, 1901.

(No Model.) 31 Sheets—Sheet 22.

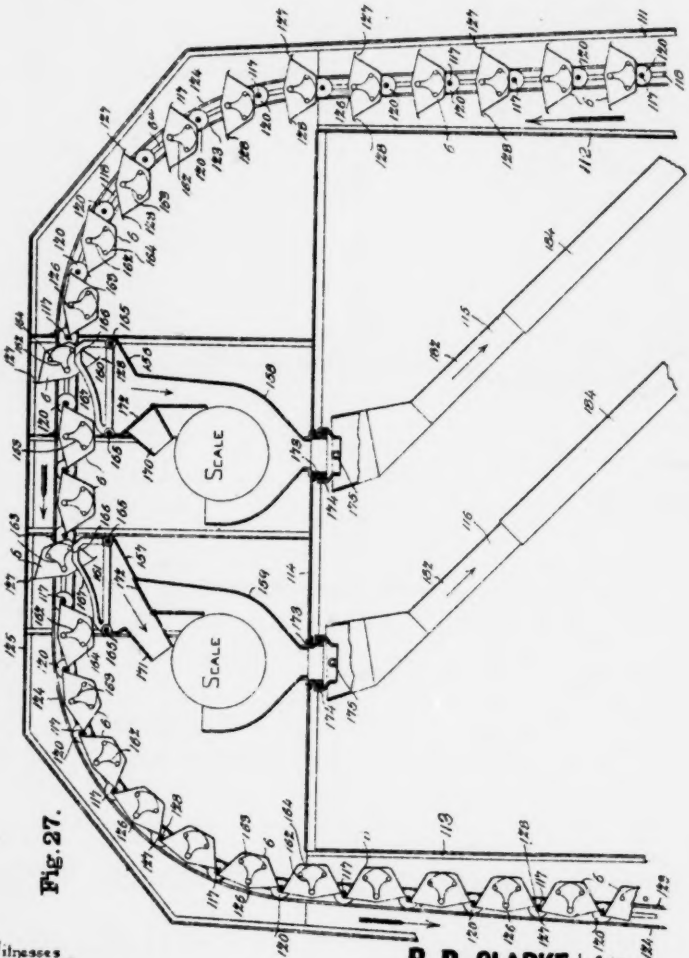


Fig. 27.

Witnesses
E. F. Stewart
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764

382-383

No. 714,150

Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 26, 1901.

(No Model.)

31 Sheets—Sheet 23.

Fig. 28.

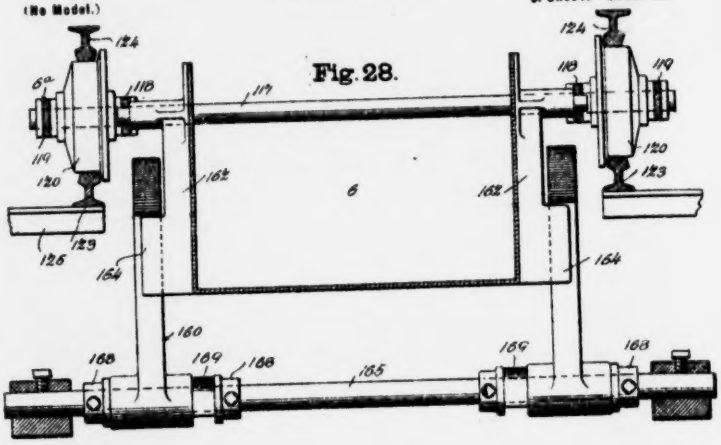
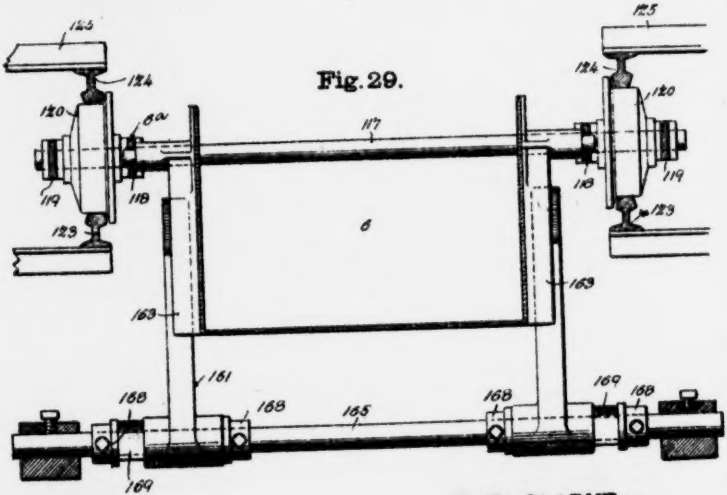


Fig. 29.



Witnesses

E. F. Stewart

H. F. Riley

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Attorneys

765

384-385

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 26, 1901.)

(No Model.) 31 Sheets—Sheet 24.

Fig. 30.

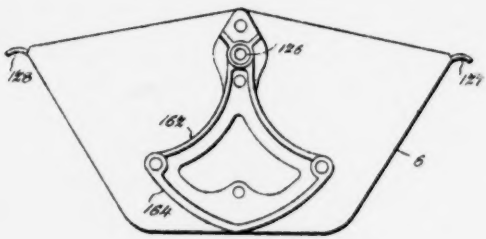


Fig. 31.

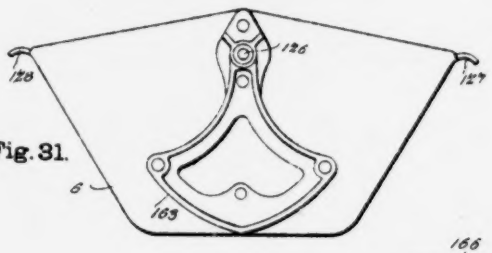


Fig. 32.

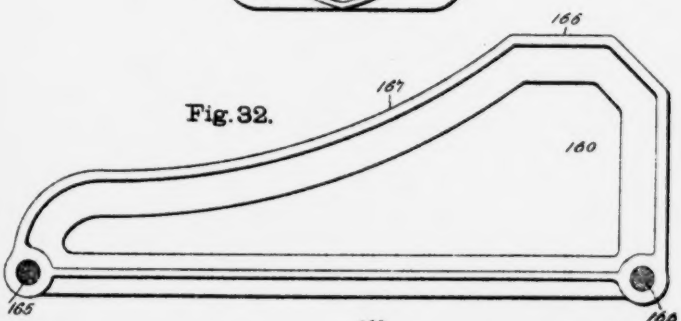
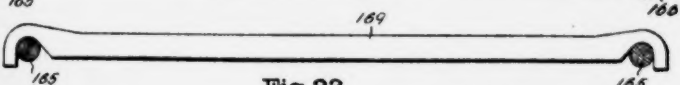


Fig. 33.



Witnesses

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766

386-387

No. 714,150

Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 26, 1901.

(No Model.)

31 Sheets—Sheet 25

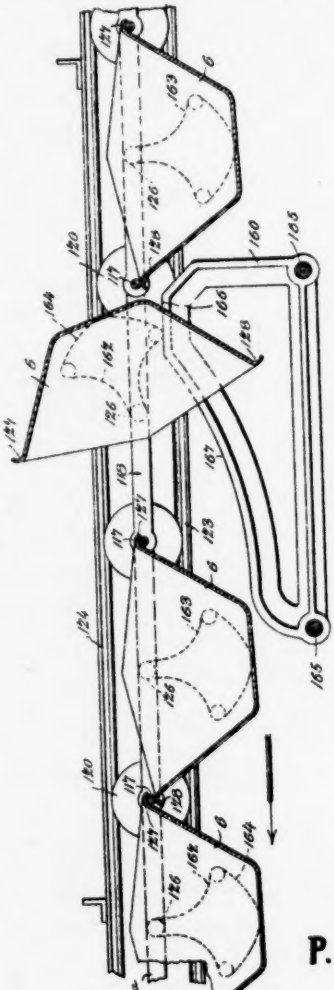


Fig. 34.

Witnesses
B. F. Stewart
H. A. Riley

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767

388–389

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 26, 1901.

No Model.) 31 Sheets—Sheet 26.

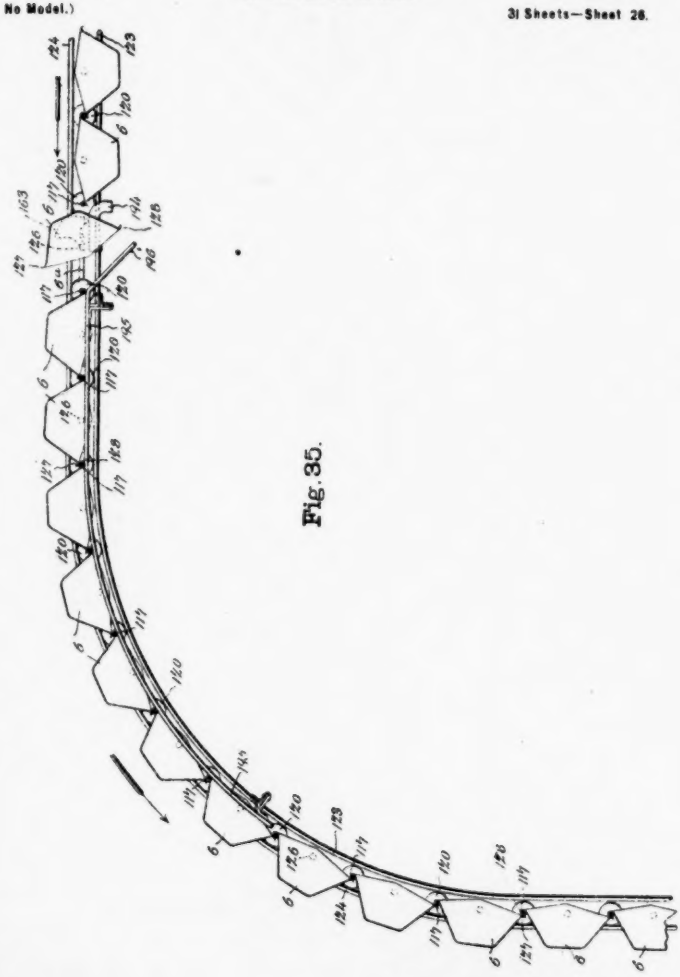


Fig. 35.

Witnesses

E. F. Stewart

T. J. Riley

P. B. CLARKE Inventor

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Attorneys

768

390-391

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK

(Application filed Jan. 28, 1901.)

(No Model.) 31 Sheets—Sheet 27

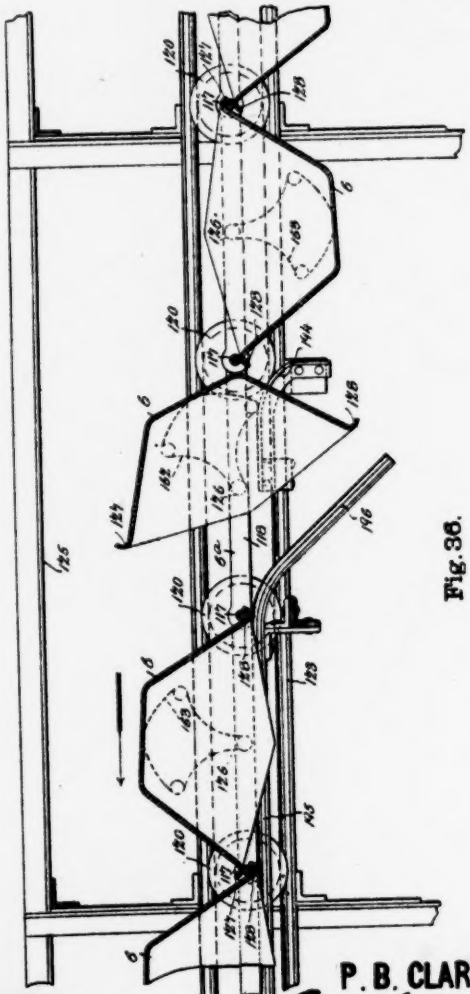


Fig. 36.

Witnesses

P. B. CLARKE Inventor

By Crosby & Co.

Attorneys

769

392–393

No. 714,150. Patented Nov. 25, 1902.

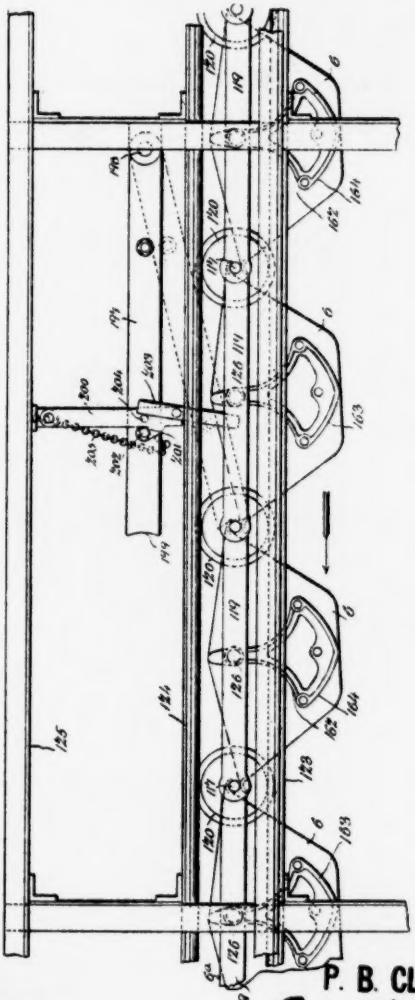
P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 26, 1901.)

(No Model.) 31 Sheets—Sheet 28

Fig. 37.



Witnesses
E. F. Stewart
H. C. Riley

P. B. CLARKE Inventor
By C. A. Snow & Co.
Attorneys

770

394-395

No. 714,150. Patented Nov. 25, 1902.

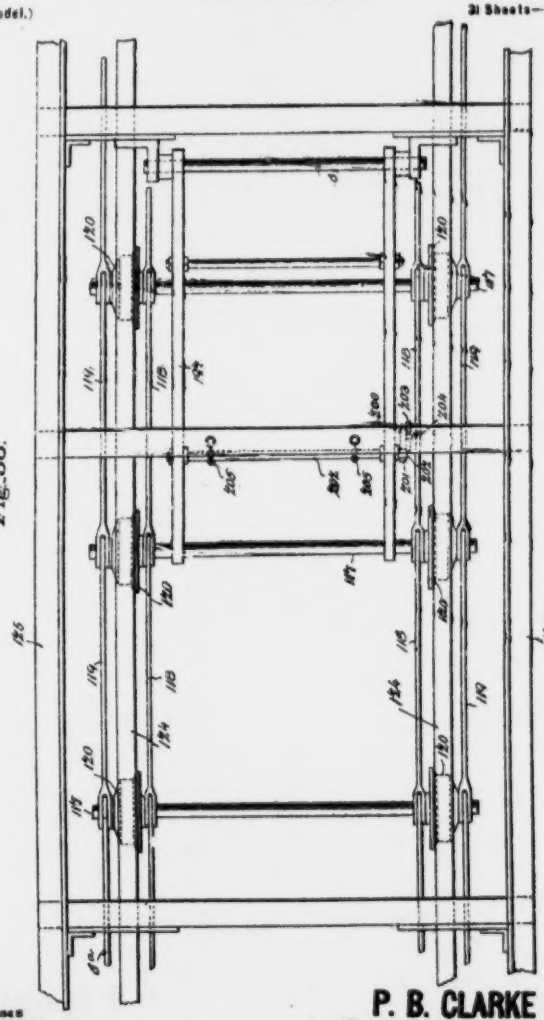
P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

(Application filed Jan. 26, 1901.)

(No Model.) 21 Sheets—Sheet 29.

Fig. 38.



Witnesses
E. F. Stewart.
H. C. Riley

P. B. CLARKE Inventor
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Attorneys

396-397

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 29, 1901.

(No Model.) 31 Sheets—Sheet 30

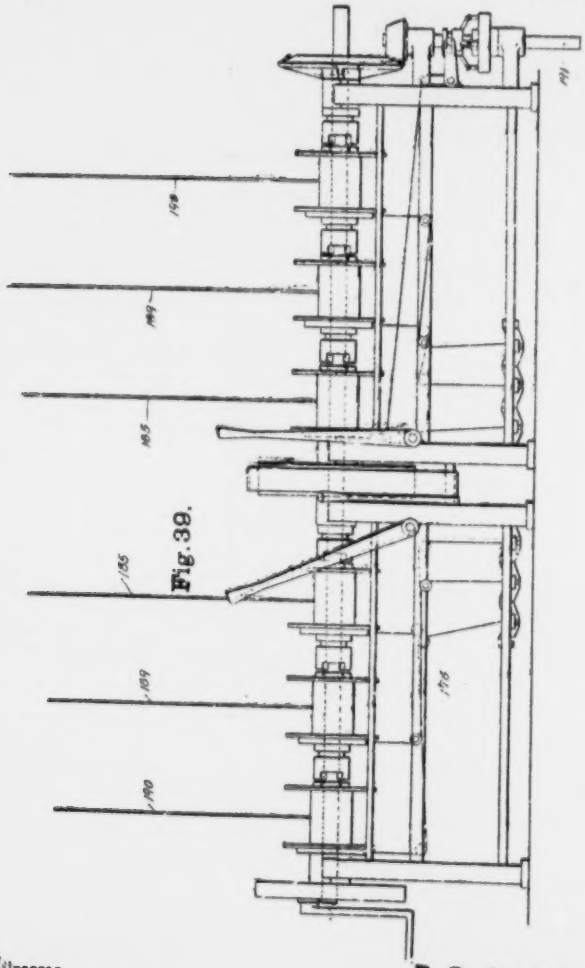


Fig. 39.

Witnesses
E. F. Lewis
H. A. Pilly

P. B. CLARKE Inventor
By C. A. Snow & Co.
Attorneys

398

No. 714,150. Patented Nov. 25, 1902.

P. B. CLARKE.

APPARATUS FOR HANDLING MATERIAL IN BULK.

Application filed Jan. 28, 1901.

(No Model.) 31 Sheets—Sheet 31.

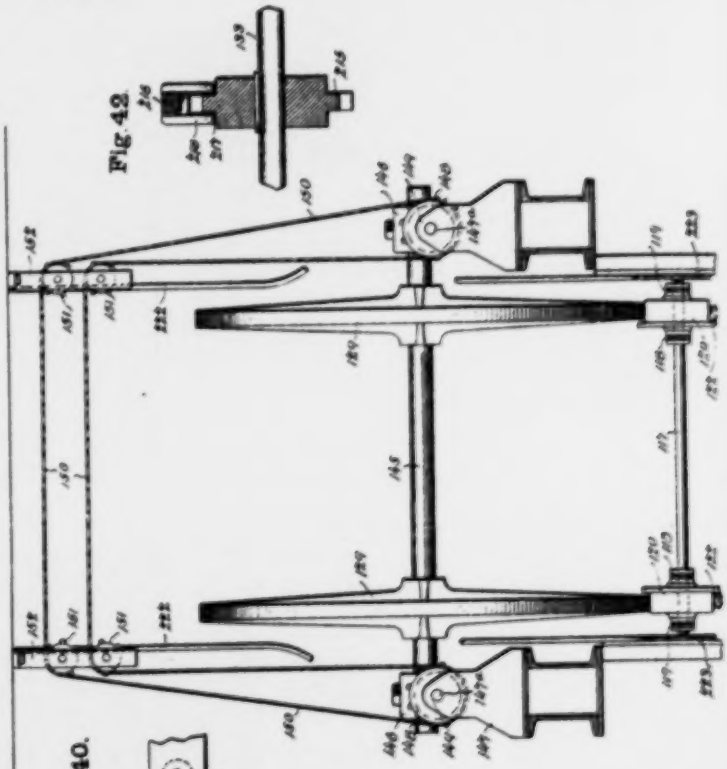


Fig. 42.

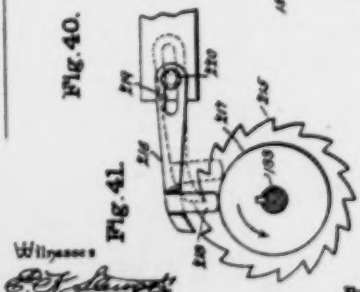


Fig. 40.

Fig. 41.

Witnesses:

P. B. CLARKE Inventor

By Cabrow & Co.

Attorneys

UNITED STATES PATENT OFFICE.

PEETE B. CLARKE, OF NEW YORK, N. Y.

APPARATUS FOR HANDLING MATERIAL IN BULK.

SPECIFICATION forming part of Letters Patent No. 714,150, dated November 25, 1902.

Application filed January 28, 1901. Serial No. 44,778. (No model.)

To all whom it may concern:

Be it known that I, PEETE B. CLARKE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a new and useful Apparatus for Handling Material in Bulk, of which the following is a specification.

The invention relates to improvements in apparatus for handling material in bulk.

The object of the present invention is to improve the construction of apparatus for handling material in bulk and to provide an apparatus of this character designed for loading vessels at a wharf or offshore, and particularly for supplying such vessels with coal, and adapted to be applied to a barge or analogous vessel and capable of rapidly transferring the contents of the same to the vessel to be loaded and of simultaneously weighing the material.

Another object of the invention is to provide adjustable and extensible chutes adapted to be turned in any direction and to be arranged at any desired position at either side of the barge and capable of being readily handled to change them from one position to another to enable the material to be delivered in the desired quantities to different portions of a vessel.

Furthermore, the invention has for its object to provide means for automatically dumping the contents of the buckets of the conveyer into the chutes and for automatically reversing the buckets, so that they will reënter the barge in proper position for receiving another charge.

Furthermore, the invention has for its object to provide a safety-stop for automatically locking the conveyer against backward movement to prevent the loaded flight of the conveyer in event of breakage from moving backward under the influence of its load and injuring the apparatus.

Furthermore, the invention has for its object to provide a barge divided into separate compartments or bins and provided at the opposite sides thereof with upwardly-swinging dumping-gates and at the bottoms of the same with sliding doors or cut-offs and to enable the sliding doors or cut-offs, the dumping-gates, and agitators to be successively operated, whereby the contents of the barge will be gradually delivered to the buckets of the conveyer to reduce the strain on the latter to a minimum.

Another object of the invention is to prevent the buckets from being overloaded, so that there will be no liability of the coal or other material spilling out of the buckets while the latter are traveling from the bins or compartments of the barge to the chutes.

It is also the object of the invention to enable hydraulic rams to be employed for lifting the dumping-gates and to enable such rams to be located at opposite sides of the gates and to have their power automatically equalized, so that the dumping-gates will be raised uniformly and prevented from sagging or twisting under the weight of the coal or other material irrespective of the uneven distribution of the same on the dumping-gates.

The invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended.

In the drawings, Figure 1 is a diagrammatic longitudinal sectional view of the barge, illustrating the general arrangement of the parts. Fig. 2 is a vertical longitudinal sectional view of the bow of the barge. Fig. 3 is a similar view of the stern of the barge. Fig. 4 is an enlarged sectional view illustrating the arrangement of the drive-wheel for actuating the conveyer. Fig. 5 is a transverse sectional view of the barge looking forward. Fig. 6 is a transverse sectional view of the stern of the barge looking forward. Fig. 7 is an enlarged transverse sectional view of the lower portion of one of the bins or compartments of the barge, illustrating the arrangement of the conveyer, the trimmer, the sliding door or cut-off, and the agitator. Fig. 8 is an enlarged detail plan view illustrating the construction of the lower portion of the bins or compartments. Fig. 9 is an enlarged vertical sectional view on the line 9 9 of Fig. 8. Fig. 10 is a similar view on the line 10 10 of Fig. 8. Fig. 11 is an enlarged sectional view illustrating the construction for operating the sliding doors or cut-offs of the bins or compartments. Fig. 12 is a transverse sectional view illustrating the construction for actuating the rock-shaft for sliding the doors or cut-offs. Figs. 13 and 14 are sectional views illustrat-

ing the construction of the steam-cylinder for actuating the rock-shaft which is connected with the sliding doors or cut-offs. Fig. 15 is a diagrammatic view illustrating the arrangement of the hydraulic rams for raising the dumping-gates of the barge. Fig. 16 is a transverse sectional view illustrating the arrangement of the hydraulic rams. Fig. 17 is a vertical sectional view on the line 17 17 of Fig. 16. Fig. 18 is a plan view of one of the dumping-gates. Fig. 19 is a detail sectional view of the same on the line 19 19 of Fig. 18. Figs. 20, 21, and 22 are detail views illustrating the construction of the equalizing or compensating valve for controlling the hydraulic rams. Fig. 23 is an enlarged detail view of one of the chutes. Fig. 24 is an enlarged detail view illustrating the arrangement of the chutes and the booms. Figs. 25 and 26 are detail views of the boom. Fig. 27 is a vertical sectional view of the upper portion of the conveyer and the chutes, illustrating the manner of dumping the buckets. Figs. 28 and 29 are detail views illustrating the arrangement of the dumping-cams. Figs. 30 and 31 are detail views of the buckets. Fig. 32 is an enlarged detail view of one of the dumping-cams. Fig. 33 is a detail view of one of the lock-bars for holding the dumping-cams against lateral movement. Fig. 34 is an enlarged detail sectional view illustrating the manner of dumping the buckets. Fig. 35 is a detail view of the rear portion of the upper flight of the endless conveyer, illustrating the arrangement of the reversing-cam. Fig. 36, is an enlarged sectional view of the same. Fig. 37 is a detail view illustrating the arrangement of the safety-stop. Fig. 38 is a plan view of the same. Fig. 39 is an elevation of the winch, illustrating the arrangement of the series of drums. Fig. 40 is a sectional view illustrating the construction for controlling the tension device. Figs. 41 and 42 are detail views illustrating the construction of the safety pawl and ratchet.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

1 designates a barge provided with a longitudinal series of bins or compartments 2, separated from one another at the bottom by partial transverse bulkheads or partitions 3, and each bin or compartment is provided at its bottom with a series of depending hoppers 4, having sliding doors or cut-offs 5, adapted to be opened to permit the coal to be discharged from the bins or compartments into buckets 6 of an endless conveyer 6*. The endless conveyer has one of its flights arranged beneath the longitudinal series of bins or compartments, and the cut-offs or doors of the compartments are adapted to be successively opened by the means hereinafter described, so that the cut-offs or doors of only one compartment or bin will be open at one time, whereby the strain on the conveyer incident to filling the buckets thereof with coal or other material will be reduced to a minimum. The bins or compartments, which terminate short of the ends of the barge, are spaced sufficiently from the bottom of the same to provide the necessary room for the bottom horizontal flight of the conveyer, and the said bins or compartments may be supported by any suitable structure. The barge is provided with a suitable hood 7, extending over the bins or compartments, and the latter have curved side walls 8, extending upward from the outer edges of upwardly-swinging dumping-gates 9, which are hinged at their inner edges 10 at opposite sides of the series of depending hoppers 4 of each bin or compartment, and the said gates 9 are adapted to be swung upward by the means hereinafter described to the position illustrated at the left-hand side of Fig. 5 of the accompanying drawings to arrange them in the same plane as the inclined sides of the depending hoppers 4, whereby the entire contents of the bins are directed into the hoppers. The upper portions or edges of the curved side walls 8 are connected with the deck of the barge by short inclined and vertical walls 11 and 12, the inclined walls 11 being located in the same inclined planes as the inclined sides of the hoppers 4 and the upwardly-swinging doors or gates 9 being adapted to extend across the space between the walls 11 and the inclined sides of the hoppers.

The sliding door 5 is mounted in suitable ways, preferably consisting of opposite horizontal bars 13, provided at intervals with bosses or enlargements 14, rounded at their upper edges, as clearly illustrated in Fig. 7 of the accompanying drawings, to reduce the friction to a minimum and to prevent the material from accumulating on them. Each door is provided at one side with a pair of depending ears arranged at opposite sides of the inner end of a link 15 and pivoted to the same, and the said link 15 extends outward to an arm 16, loosely mounted on a longitudinal rock-shaft 17 and adapted to be coupled thereto and uncoupled therefrom by the means hereinafter described, whereby the sliding doors or cut-offs are adapted to be operated independently of one another, so that one or more may be operated when the rock-shaft is partially rotated.

The sides of the depending tapering portions or hoppers 4 incline downward and inward from the inner hinged edges of the upwardly-swinging dumping-gates, and the end walls of the hoppers 4 incline downward from the lower edges of the transverse bulkheads and from suitable supports located between the bulkheads. Each bin or compartment is preferably provided with three depending hoppers; but the number may be varied, as will be readily apparent. The outer end walls of the end hoppers of the series are located at the bulkheads, and the adjacent upper edges of the inner inclined end walls of the series are suitably secured to the inter-

mediate supports 18, which may consist of angle-iron beams or channel-iron beams or any other form of support.

The walls at one side of the hoppers are provided with slots 19 to permit the passage of arms 20 of agitators 21, and the inner ends of the sliding doors or cut-offs are provided with corresponding slots, which register with the slots 19 and which form openings for the agitators. The agitators are adapted to be rotated by the means hereinafter described to cause the coal or other material to flow downward and to prevent a mass of coal from lodging or arching within the bins or compartments. The material is directed into the buckets of the conveyer, as illustrated in Fig. 7, by oppositely-inclined plates 23 and 24, terminating directly above the buckets and forming supports for longitudinal bars 25. The plate 23 at one side of the barge is provided with a slot or opening 26 to afford a passageway for the link 15, and the plate 24 at the opposite side of the barge is provided with slots or openings 27 to permit the passage of the arms of the agitators. The plate 24 has a guard 28 secured to its lower face and adapted to direct into the buckets any material escaping through the slots or openings of the plate 24.

Each of the arms 16 of the rock-shaft 17 is provided with a clutch-face 29, adapted to interlock with a corresponding clutch-face of a sliding clutch-section 30, whereby the arm of the rock-shaft is coupled to the clutch-section 30. The rock-shaft 17, which is located at one side of the barge, extends longitudinally thereof, and the clutch-sections 30, which are keyed or otherwise secured to the rock-shaft, are adapted to slide thereon to interlock with the arms 16 and to release the latter. Each clutch-section 30 is provided with an annular groove, which is engaged by lugs or projections 31 of the sides of a yoke 32, which is pivoted to an inner arm of a transversely-disposed rock-shaft 33. Each rock-shaft 33 is arranged at an inclination and is journaled in suitable bearings, its inner arm 34 being located above the rock-shaft 17, and the arm 35 at the outer end of the transverse rock-shaft is connected with the lower end of an operating-rod 36. The operating-rod, which extends to the deck and which is adapted to permit the couplings or clutches to be controlled from that point, is composed of yieldingly-connected upper and lower sections 37 and 38, having overlapped adjacent ends. The overlapped inner ends of the upper and lower sections of the operating-rod are slidingly connected and are engaged by coiled springs 39, which are adapted to permit a limited independent movement of the sections. The upper section 37 is provided with a swiveled handle or grip 40, having a shank 41, arranged in a suitable opening or slot at the deck and provided with a lug or flange 42, adapted to be arranged transversely of the slot when the operating-rod is raised, whereby the latter is maintained in its elevated position. The swiveled handle or grip is adapted to be turned when the operating-rod is elevated to permit the lug to lie transversely of the slot or opening. When the lifting-rod is drawn upward, the transverse rock-shaft is partially rotated and the inner arm thereof is swung in the direction of the adjacent arm 16 and the clutch-section is coupled with the hub of the arm. The clutch-section 30 is provided with lugs or projections to engage corresponding recesses of the clutch-face of the hub of the arm 16, and if the recesses of the hub of the arm should be out of alinement with the lugs or projections of the clutch-section the coiled springs 39 will permit the upper section of the operating-rod to be raised sufficiently to lock it, and it will cause the clutch-section 30 to spring into engagement with the clutch-face of the arm 16, when the longitudinal rock-shaft is rotated and the said recesses brought in alinement with the lugs or projections.

The arm 16 inclines upward and inward toward the sliding door or cut-off when the latter is closed, and it is inclined in the opposite direction when the door is open, as illustrated in Fig. 12 of the accompanying drawings. The rear end of the longitudinal rock-shaft 17 is provided with an arm 43, extending downward and outward, as clearly shown in Fig. 12, when the door is open and connected with a vertically-movable piston 44 of a vertical steam-cylinder 45 by vertical links 46. When the piston-rod is moved downward, the longitudinal rock-shaft is rotated to swing the arm 16 outward, and those arms 16 which are coupled to the longitudinal rock-shaft will be oscillated and the sliding doors or cut-offs with which they are connected will be opened.

The vertically-movable piston-rod 44 is provided with a piston-head 47, arranged within the cylinder 45, which is provided at one side with a steam-chest 48, disposed vertically and having a vertically-reciprocating tubular slide-valve 49 within it. The ends of the vertically-disposed cylinder 45 are connected with the ends of the steam-chest by upper and lower ports 50 and 51, and the vertically-movable slide-valve is provided with a reduced central portion located between enlarged ends of the slide-valve and providing an annular recess adapted when the slide-valve is at the limit of its movement in either direction to establish a communication between the steam-chest and one end of the cylinder to admit steam to one side or the other of the piston-head. The slide-valve is provided with upper and lower apertures 52 and 53, adapted to alternately register with the said ports to establish a communication between the interior of the cylinder and the interior of the slide-valve to permit the steam to exhaust from the former. The said slide-valve is provided between the upper and lower apertures and the terminals of the central re-

duced portion with solid imperforate portions, which are adapted, as illustrated in Fig. 13 of the accompanying drawings, to cover the ports and shut off the steam from both ends of the cylinder. The piston-rod at the end of each stroke is adapted to operate the slide-valve to carry it into the position shown in Fig. 13 of the drawings, so that the operator after actuating the operating mechanism, hereinafter described, may leave the steam-cylinder unattended.

The upper end of the slide-valve is connected with a vertically-movable rod 54, mounted in suitable guides and connected by a lever 55 with the piston-rod and with the operating mechanism. The upper end of the piston-rod is provided with a horizontal guide 56, receiving a pivot or other suitable device of the adjacent end of the lever, which has its other end connected by a rod 57 with one arm of a bell-crank lever 58. The rod 57 is disposed vertically, and the other arm of the bell-crank lever 58 is connected by a horizontal rod 59 with an operating-lever 60, mounted on the exterior of the hood at one side thereof and arranged within convenient reach from the deck and adapted to be swung upward and downward to reciprocate the slide-valve. When the slide-valve is moved in either direction by the operating mechanism, its position is changed, and steam is admitted to the opposite side of the piston-head, between the same and the adjacent end of the cylinder, and the piston is caused to reciprocate. The reciprocation of the piston oscillates the lever, which is connected with the slide-valve by the rod 54, and this oscillation of the lever 55 carries the slide-valve to the intermediate position illustrated in Fig. 13 of the drawings.

Each pair of agitators is mounted on a short longitudinal shaft 61, journaled in suitable bearings at one side of the adjacent hopper 4 and extending through the space between the adjacent inclined side of the hopper and the inclined plate 24 and connected by sprocket-gearing with a long longitudinal shaft 62. A large sprocket-wheel 63 is mounted on the short shaft 61 near one end thereof, and a sprocket-chain 64 extends from the sprocket-wheel 63 to a sprocket-pinion 65, loosely mounted on the longitudinal shaft 62, which is located at the side of the hoppers 4 opposite to that on which the longitudinal shaft 17 is located. The sprocket-chain is disposed transversely of the barge at one side of the hoppers, and the sprocket-pinion is provided with a clutch-face 66, adapted to be engaged by a corresponding clutch-face of a sliding clutch-section 67, whereby the sprocket-pinion is coupled to the longitudinal shaft and is caused to rotate therewith to actuate the agitators. The sliding clutch-section 67, which is slidingly connected with the shaft by any suitable means, is provided with an annular groove, which is engaged by projections or lugs of a yoke 68 of a depending arm 69 of a transverse rock-shaft 70, extending from the longitudinal shaft 62 to the opposite side of the bins and provided with an approximately horizontal arm 71, which is adapted to be oscillated similar to the arm 35 of the inclined transversely-disposed rock-shaft 33. The arm 71 of the transverse rock-shaft 70 is connected with an operating-rod 72, composed of upper and lower yieldingly-connected sections and provided at its upper end with a swiveled grip 73, adapted to be locked in an elevated position similar to the grips or handles of the operating-rods 36 for controlling the clutches of the sliding doors or cut-offs. The upper and lower sections of the operating-rod of the agitators are connected at their inner or adjacent ends, similar to the sections of the operating-rod 36, and the coiled springs which form the yielding connection are adapted to cause the sliding clutch-section to engage the clutch-face of the sprocket-pinion as soon as the longitudinal shaft 62 rotates should such clutch-faces be in a position to prevent such engagement when the operating-rod 72 is drawn upward to connect the corresponding agitators with the longitudinal shaft. The operating-rods 72 of the agitators are located at the same side of the deck as the operating-rods 35 of the sliding doors, so that they will be within convenient reach of the operator and will enable him to readily open the desired sliding doors and start the corresponding agitators.

The upwardly-swinging dumping-gates are provided at their sides and outer edges with antifriction-wheels 74, arranged to bear against the walls of the bins or compartments and adapted to enable the dumping-gates to swing upward with a minimum amount of friction. In order to prevent the coal or other material from becoming wedged between the edges of the dumping-gate and the walls of the bin or compartment and escaping or interfering with the upward-swinging movement of the said gates, the latter are provided at their sides and outer edges with plates or strips 76, secured to the upper faces of the dumping-gates and provided with flanges 77, extending outward and upward and frictionally engaging the walls of the bin or compartment. These marginal flanges of the dumping-gates are split at intervals to provide a continuous series of resilient tongues, which constitute the flanges 77 and which enable the necessary resiliency to be readily obtained without materially impairing the strength of the flanges.

The upward movement of the oppositely-disposed dumping-gates is effected by means of hydraulic rams 78, arranged in pairs and located at opposite sides of the dumping-gates, as clearly illustrated in the diagrammatic view in Fig. 15 of the accompanying drawings. These hydraulic rams, which may be of any desired construction and the specific construction of which constitutes no part of the present invention, are provided at

opposite sides with trunnions and are adapted to rock or oscillate as their plungers 79 move upward and downward in raising and lowering the dumping-gates. The trunnions of the rams are arranged in suitable bearings 80, and the inner trunnions are hollow and are connected with pipes 81 for supplying the water under pressure to the rams. When the water is admitted to the hydraulic rams, the plungers thereof move upward and carry with them the dumping-gate with which they are connected, and the admission of water to these rams is controlled by the means hereinafter described to equalize the power and to proportion the same to the load to be raised by the respective rams to cause the dumping-gates to be uniformly raised even when the coal is unevenly distributed over them, so that the said gates will not sag at either side and will not be twisted or strained by the action of the hydraulic rams. The adjacent ends of the pipes 81 are connected with the opposite sides of a valve-casing 82, having a longitudinal chamber 83, and provided with ports 84, extending therefrom to the pipes 81, which lead to the hydraulic rams. The valve-casing, which is disposed transversely of the barge, is provided at its top with an inlet-port 85, and it has an outlet or exhaust port 86 at its bottom, and it contains a reciprocating valve 87 and an oscillating valve 88, adapted to reciprocate with the valve 87 to be carried to and from the ports 84, which lead to the ram, and capable of oscillating over such ports to cause an even or uniform flow of water through the same to supply each of the rams with the same pressure and adapted to vary the flow of water through the said ports 84 to cause one of the rams to operate with greater power than the other when the load to be lifted is unevenly distributed over the surface of the dumping-gate. The valves 87 and 88 are connected with sections 89 and 90 of a valve-stem which is adapted to reciprocate to move the valve 87 longitudinally, and this valve 87 is provided with a recess 91 and has a solid portion 92. The recess 91 is adapted to establish a communication between the outlet or exhaust port 86 and the ports 84 to permit the water to exhaust from the hydraulic rams after the latter have been operated to raise the dumping-gates and it is desired to lower the gate. The solid portion 92 of the reciprocating slide-valve 87 is adapted to cover the outlet or exhaust port when the ports 84 are open, and it is also adapted to cover the ports 84 to cut off the water from the rams. The upper inlet-port 85 is connected by a suitable feed-pipe 93 with the tank 94, and the exhaust port or outlet is connected with an exhaust-pipe 95, which is adapted to return the water to the tank. The water is forced through the feed-pipe under pressure by any suitable means, and as such mechanism does not form a part of the present invention illustration thereof is deemed unnecessary.

The section 89 of the valve-stem is connected by links with an arm 96 of a rock-shaft 97, disposed approximately vertically and extending to the deck of the boat and provided at its upper end with a suitable arm or handle 98, by means of which the rock-shaft 97 is partially rotated to reciprocate the valve-stem in either direction.

The valve-stem section 90 is provided with a threaded socket for the reception of a threaded shank 99 of the section 89 of the stem, and the said section 90 is adapted to be oscillated by the means hereinafter described to oscillate the valve 88 over the ports 84 to vary the size of the openings thereof. The inner adjacent ends of the sections of the valve-stems are preferably reduced to fit in recesses of the valves 87 and 88, and coiled springs 100 and 101 are interposed between the sections of the valve-stem and the said valves at the bottoms of the recesses to hold the valves tightly against the walls of the chamber of the valve-casing.

The outer end of the section 90 of the valve-stem is provided with a laterally-extending head 102, forming a pair of oppositely-disposed arms and connected to the inner ends 103 of cables 104, which have their outer ends attached to the adjacent dumping-gate at the side edges thereof. The outer ends of the cables or other flexible connections pass around guide-pulleys 105, which are connected with suitable brackets at the lower edges of the partial transverse bulkheads which separate the bins or compartments, and the said cables extend from the outer guide-pulleys 105 to central guide-pulleys 106. The cables are looped by means of the central pulleys 106 and a pair of pulleys 107, located at opposite sides of and arranged slightly below the central pulleys 106. The loops which depend from the guide-pulleys 106 and 107 receive pulleys 108 of a weight 109. The cables after forming the loops extend downward from the pulleys 107 to the laterally-extending arms formed by the head 102. The inner portions of the cables cross each other and extend to the opposite sides of the valve in order to connect the cable at the right-hand side of Fig. 17 of the accompanying drawings with the right-hand arm of the valve-stem, and the cable at the left-hand side is connected with the other arm. Should the right-hand side prove lighter than the left-hand side of the dumping-gate, the right-hand arm will be lifted and the oscillatory valve will be swung toward the right to partially close the right-hand feed-port and lessen the power of the right-hand ram. This movement will correspondingly increase the size of the entrance of the feed-port at the left-hand side of the compensating valve, and the left-hand hydraulic ram will have its power correspondingly increased. The power will be proportioned between the rams to the loads to be lifted by them, so that they will operate with equal facility on an unevenly-distributed load. The weight keeps the ca-

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bles taut; but only a slight movement of the oscillatory valve is necessary to effect this result and only a slight upward movement of the lighter side of the dumping-gate will occur before the compensating action is effected.

The barge is provided at its front portion with a tower 111, composed of front and rear sides 112 and 113, spaced apart and connected by a horizontal top portion 114, which is preferably housed in to protect the dumping mechanism and the scales, hereinafter described, from the weather. The front side or leg 112 of the tower is located at the bow of the barge and the rear side or leg is located at a point slightly in advance of the center of the same, ample space being provided between the sides or legs of the tower to enable a pair of extensible telescoping chutes 115 and 116 to swing from one side of the barge to the other. The endless conveyer 6ª is composed of a horizontal flight located at the bottom of the barge beneath the bins or compartments, an ascending upright flight located at the front side or leg of the tower, a descending upright flight supported by the rear leg or side of the tower, a top horizontal flight extending across the top of the tower, and an intermediate horizontal flight extending from the descending upright flight rearward over the rear portion of the barge to the rear end of the bottom horizontal flight, which travels beneath the bins or compartments.

The endless conveyer is provided at intervals with transverse shafts 117, which are connected by inner and outer links 118 and 119, arranged in pairs at opposite sides of the conveyer and located at the inner and outer sides of tracks hereinafter described. The shafts 117, which support the buckets 6, are provided at their ends with suitable spindles or journals for the reception of wheels 120, provided at their inner faces with peripheral flanges and arranged to run on suitable rails. The wheels of the bottom horizontal flight of the endless conveyer travel between upper and lower longitudinal rails 121 and 122, arranged in pairs at opposite sides of the conveyer, as clearly illustrated in Fig. 7 of the accompanying drawings. These rails 121 and 122 may be of any desired construction, and the upper rails 121 are inverted to bring their treads at the tops of the wheels of the endless conveyer. The other flights of the endless conveyer have their wheels arranged between and supported by inner and outer rails 123 and 124, extending upward at the front side or leg of the tower and across the top of the same and then downward and rearward to the stern of the boat. These rails 123 and 124 are supported by the tower and by a suitable structure 125, located above and extending longitudinally of the rear portion of the barge, as clearly indicated in Fig. 1 of the accompanying drawings.

The buckets 6, which are pivotally suspended from the conveyer when loaded, are provided at opposite sides with suitable journals or trunnions 126, arranged in suitable bearing-openings of the inner links of the endless conveyer, as clearly indicated in Fig. 7 of the drawings. The buckets are provided at their ends with curved lips 127 and 128, arranged, respectively, at the front and back of the buckets and below and above the transverse shafts of the conveyer when the buckets are arranged at the bottom of the barge and are receiving or have received a charge of coal or other material. The buckets when arranged at the bottom of the barge, with their curved lips in contact with the transverse shafts of the conveyer, are slightly tilted, and they are firmly supported in practically an upright position by the said transverse shafts; but as soon as the buckets begin to ascend at the front of the barge they will be caused to assume an upright position by their weight and will remain in such position until they are dumped to discharge their contents by the means hereinafter described. The front ends of the rails are spaced apart to receive guide-wheels 129 and are preferably diverged, as indicated in Fig. 1 of the accompanying drawings, to enable the wheels of the conveyer to readily enter and leave the spaces between the rails, and the rear ends of the rails may be slightly diverged, as shown in Fig. 1.

The endless conveyer is driven by a pair of wheels 130 of the sprocket type, provided at intervals at their peripheries with antifriction-wheels 131, adapted to engage the wheels at opposite sides of the endless conveyer, as clearly indicated in Fig. 4 of the accompanying drawings, whereby the friction is reduced to a minimum. The sprocket-wheels 130 are fixed by any suitable means to a lower horizontal shaft 132, disposed transversely of the barge at the back thereof and journaled in suitable bearings and connected by a train of gears with a main horizontal shaft 133. The main horizontal shaft, which is arranged parallel with the shaft 132, is connected by the means hereinafter described with an engine 134 and is provided with a pinion 135, which meshes with a large gear-wheel 136 of a counter-shaft 137, located midway between the shafts 132 and 133. The gear-wheel 136 is located at one end of the intermediate or counter shaft 137, which is provided at its other end with a pinion 138, meshing with a gear-wheel 139 of the shaft 132. This construction forms a train of gears for connecting the main shaft 133 with the shaft which drives the endless conveyer.

The main shaft 133 is provided with a sprocket-pinion 140, which is connected by a sprocket-chain 141 with a lower sprocket-pinion 142, having spur-teeth at one side to mesh with a bevel-gear 143 of the longitudinal agitator-driving shaft 62, whereby motion is communicated from the main shaft 133 to the agitators.

The steam for operating the engine and for

driving the piston of the vertically-disposed steam-cylinder 45 is received from a boiler 144, having suitable pipe connections with the steam-chest of the engine and the cylinder 45. These pipe connections may be of any desired construction and arrangement, and as their specific construction does not form a part of the present invention further description thereof is deemed unnecessary.

The guide-wheels 129 are mounted on a horizontal shaft 145, having its ends arranged in bearings of sliding journal-boxes 146, mounted in longitudinal ways 147 and connected with the ends of threaded rods 147*. The threaded rods, which have their front ends attached to the sliding journal-boxes, are engaged by rotary nuts 148 and extend through ears or lugs 149, arranged in pairs and preferably formed integral with the longitudinal guides. The guides, which may constitute a portion of a supporting-frame, may be provided with dovetailed or undercut edges to interlock with correspondingly-constructed edges of the sliding journal-boxes, and the said nuts are adapted to be rotated to move the rods longitudinally to slide the journal-boxes toward or from the ascending flight of the endless conveyer. By adjusting the guide-wheels the endless conveyer may be maintained at the desired tension. In order to enable the threaded rods to be moved simultaneously and accurately the same distance, the nuts 148 are provided with sprocket-teeth and are engaged by depending loops of a sprocket-chain 150, which extends across the space above the conveyer. The transverse portion of the endless sprocket chain 150 is composed of two flights arranged upon upper and lower sprocket-pinions 151, disposed in pairs and mounted in a suitable frame or hanger 152. The nuts are also provided with suitable openings or sockets adapted to be engaged by a rod or lever for rotating the nuts, and when either of the nuts is rotated by such a rod or lever motion will be communicated to the other through the sprocket-gearing and both nuts will be simultaneously rotated the same distance.

When the buckets 6 move forward at the bottom of the barge to receive their charge, the upper curved lips, which are located above the transverse shafts of the endless conveyer, are interposed between the said shafts and the pair of longitudinal bars 25, which are secured to the lower edges of the oppositely-inclined plates 23 and 24, and by these means the buckets are effectually prevented from tilting or swaying when the coal or other material drops into them. The excess of coal or other material falling into the buckets is scraped from them by means of a trimmer 153, located at the front side of each of the depending hoppers of the bins or compartments and consisting of a plate provided at its upper edge with a pintle 154, arranged in suitable bearings or eyes of a transverse plate or partition 155, disposed vertically and located at the front edges of the oppositely-inclined plates 23 and 24. The plates 23 and 24 coöperate with the trimmer and with the plate 155 to form a lower chute or spout for directing the material into the buckets. The trimmer is provided with laterally-extending arms 155*, consisting of a bar secured to and projecting from the sides of the trimmer, as clearly shown in Fig. 7 of the accompanying drawings. The outer ends of the arms 155* are connected by stout coiled springs 155* with the adjacent upper rails 121, and should a lump of coal be interposed between the bucket and the trimmer the bucket will be moved forward and will swing the trimmer forward until the springs are distended sufficiently to cause the trimmer to cut through the coal, whereby all excess of coal is effectually removed from the buckets. The excess of coal as it is scraped from one bucket is delivered into the next bucket, and the buckets are successively and uniformly filled without spilling any of the coal or other material. The trimmer tapers from top to bottom, and it extends downward between the longitudinal bars 25, which have their lower edges arranged sufficiently above the upper lips 128 of the buckets to clear the same when the said lips are supported by and in contact with the transverse shafts of the endless conveyer. The transverse plate 155, upon which the trimmer is mounted, tapers toward its bottom to provide inclined side edges to conform to the inclined side plates 23 and 24 and is provided with a rectangular opening to enable the trimmer-plate to engage the coal, or rather the excess of coal, carried by the buckets.

The loaded buckets ascend the front side of the tower in an upright position, as clearly illustrated in Fig. 27 of the accompanying drawings, being solely supported by their pivots or trunnions 126, and there is no liability of any of their contents spilling while they are traveling from the bottom of the barge to the top of the tower. In their passage across the top of the tower the buckets are dumped, as indicated in Fig. 27 of the drawings, to discharge their contents into hoppers 156 and 157 of scale-casings 158 and 159 by means of laterally-adjustable dumping-blocks 160 and 161. The dumping-blocks 160 and 161, which are located at opposite sides of the hoppers 156 and 157, are adapted to be engaged by and are located within the paths of cams 162 and 163, secured to the opposite sides of the buckets and arranged on the exterior thereof and having the pivots or trunnions of the buckets formed integral with their upper portions. The cams 162 and 163 are alternately arranged, so that every other bucket will engage the first dumping-blocks 160, while the other buckets will pass these dumping-blocks 160 and engage the other dumping-blocks 161, so that the contents of the buckets will be evenly distributed to the hoppers 156 and 157. The cams 162 and 163 have their sides and bottoms of the same contour,

and the cams 162 are provided with a projection or enlargement 164 to enable them to engage the first dumping-blocks 160, which are located out of the paths of the cams 163 of the other buckets. The cams 162 and 163 have tapered upper portions and are provided with sloping or oppositely-inclined lower edges, forming a rounded bottom.

The dumping-blocks 160 and 161 are slidingly mounted on transverse rods or bars 165 and are located directly over the hoppers of the scale-casings and are provided at their front ends with lower vertical edges and with upper inclined edges, and they have horizontal upper or top edges 166 extending from the inclined portions of the front edges to the upper terminals of long-inclined rear edges 167. When a bucket arrives at the front set of dumping-blocks, it is tilted by the same if its cams be provided with the enlargements or extensions 164, which project laterally from the opposite sides of the bucket. These extensions or enlargements 164 first engage the vertical front edges of the dumping-blocks, and as the bucket is carried forward through its pivotal connection with the inner links of the endless conveyer it is gradually tilted, and a continued forward or onward movement of the bucket draws the cams upward on the front edges of the dumping-blocks to the horizontal top edges, which are of sufficient length to hold the buckets in a substantially inverted position, as illustrated in Fig. 27 of the accompanying drawings, to enable their contents to be completely discharged into the hoppers of the scale-casings. After the cams leave the horizontal top edges of the dumping-blocks they are drawn down the inclined or sloping rear edges, which permit the buckets to gradually resume an upright position and prevent them from swinging against the transverse shafts of the conveyer with any force, whereby the buckets are prevented from being injured through contact with the dumping-blocks. The second set of dumping-blocks 161 is arranged in the paths of the cams 163, and they of course are engaged by all of the cams; but as every other bucket has had its contents discharged into the hopper of the first scale-casing only one-half of the coal or other material will be delivered to the hopper of the second scale-casing, although every bucket is dumped by the second set of dumping-blocks. The operation of dumping the material into the hopper of the second scale-casing is exactly the same as that heretofore described in connection with the hopper of the first scale-casing. The number of scale-casings and dumping-blocks may be varied by positioning the dumping-blocks and by providing cams for engaging the respective dumping-blocks. The dumping-blocks preferably consist of open frames, as clearly illustrated in Fig. 34 of the accompanying drawings, and they are provided at their bottoms with openings for the reception of the transverse rods or bars, which are preferably round, and annular enlargements or sleeves are preferably provided at the bottom openings of the dumping-blocks to increase the bearing-surface. The transverse rods or bars are provided at opposite sides with collars 168, arranged in pairs and located at opposite sides of the dumping-blocks and secured to the said rods or bars by means of clamping-screws or other suitable devices. The distance between the members of the pairs of collars is sufficient to receive the dumping-blocks and a detachable locking-bar 169, provided at its ends with hooks and adapted to rest upon and be supported by the transverse rods or bars 165. These locking-bars are adapted to be arranged at either side of the dumping-blocks to position the latter for engaging either of the cams 162 or 163. By arranging the locking-bars at the outer sides of the first set of dumping-blocks the latter will lie in the path of all of the cams, and each bucket will be dumped into the hopper of the first scale-casing. This may be desirable when it is only necessary to operate one of the chutes.

The scale-casings are designed to receive rotary scales, as indicated in Fig. 27 of the accompanying drawings; but as the particular construction of the scales does not form any part of the present invention such construction has not been illustrated. Each of the hoppers is provided with a pair of spouts 170 and 171, extending downward at an angle to each other and adapted to deliver the coal upon the scales in order that the coal or other material may be weighed as it is discharged into the vessel to be loaded. The passage of the material through the hopper is controlled by a hinged plate or cut-off 172, which is adapted, as illustrated in Fig. 27, to be arranged for closing either of the spouts 170 and 171, so that the coal may be weighed or not weighed, as desired. Should it be unnecessary or undesirable to weigh the material, the hinged plates or cut-offs will be arranged to close the spouts 170, and the material will then pass downward at the back of the scales without affecting the latter.

The scales and the scale-casings are mounted within the top of the tower, and the said scale-casings are provided with tapered lower portions forming spouts and communicating with depending annular sleeves or necks 173, arranged beneath the floor of the top of the tower and provided with suitable bearings for rotary sleeves or collars 174, to which the extensible telescopic chutes 115 and 116 are connected by suitable pivots 175. The adjustable chutes 115 and 116, which depend from the top of the tower at points between the front and rear sides or legs of the same, are adapted to rotate on the necks 173 to turn them in any direction and are capable of swinging on the horizontal pivots 175 to arrange the lower ends of the chutes at the desired elevation. The chutes 115 and 116, which are adapted to operate at either the

starboard or the port side of the barge, may be swung through the open space between the front and rear sides or legs of the tower, and they are controlled by suitable ropes or cables connected with a winch 176 and connected with booms 177 and 178, arranged in pairs at opposite sides of the top of the tower. The booms, which swing in horizontal planes, are supported in a horizontal position by guy ropes or cables 180 and 181 and are pivoted or hinged at their inner ends. The chutes, which have enlarged upper ends, are composed of upper, lower, and intermediate sections 182, 183, and 184, which are adapted to slide or telescope to vary the length of the chutes, and the telescoping or sliding movement of the sections is controlled by a rope or cable 185, secured at one end to the upper or top section of the chute and extending longitudinally of the latter to a pulley 186 of the lower or bottom section 183 and passing therefrom rearwardly along the chute to a pulley 187, mounted on the tower. The ropes or cables are then extended to the winch and are connected with suitable drums thereof. By winding the ropes or cables on the drums the chutes are shortened, and by unwinding the said cables the chutes are extended, and the weight of the sections of the chutes will cause the latter to extend themselves automatically as the cables or ropes are paid out.

The intermediate and lower sections of the chutes are connected with the booms by means of ropes or cables 189 and 190. The rope or cable 189 is connected at one end to the adjacent boom at a point intermediate of the ends thereof, and it extends downward to the intermediate section 184 and back to the boom, suitable blocks or pulleys being provided for the rope or cable. The other rope or cable 190 is arranged at the outer end of the boom and is connected in a similar manner with the lower or bottom section, and the ropes or cables are then extended over suitable pulleys to drums of the winch 176. The drums are mounted on a continuous shaft and are adapted to be coupled to the same by suitable clutches, whereby one or more may be simultaneously rotated. By winding the ropes or cables on the drums and by unwinding them therefrom the chutes may be readily controlled and may be arranged at any elevation or point between the barge and the booms, and the latter may be swung horizontally by any suitable means to extend the chutes in the desired direction. Each pair of booms is provided with the ropes or cables above explained, and the blocks or pulleys for connecting the ropes or cables 189 and 190 with the sections 183 and 184 of the chutes are designed to be detachable, preferably by means of hooks and eyes, so that the chutes may be coupled to the ropes or cables 189 and 190 of either pair of booms. When one set of ropes or cables 189 and 190 is in use, the other set is disconnected from the drums of the winch.

The horizontal shaft of the winch is connected by bevel-gearing with a short vertical shaft 191, which is similarly connected at its lower end with a horizontal shaft 192, and the latter extends from the short vertical shaft 191 to a long vertical shaft 193, which passes downward to the bottom of the barge. The lower end of the long vertical shaft 193 is connected by bevel-gearing with the longitudinal shaft with which the agitators are geared. Suitable shifting mechanism is provided for throwing the winch into and out of operation and for coupling the drums to the horizontal winch-shaft; but as this specific construction does not constitute a portion of the present invention detailed description and illustration thereof are deemed unnecessary.

After the buckets have been dumped and their contents discharged into the hoppers of the scale-casings they descend at the back of the tower and travel rearward toward the rear end of the barge, at which point they again enter the said barge and pass beneath the bins or compartments to receive another charge. At a point intermediate of the end of the intermediate horizontal flight of the endless conveyer the buckets are inverted and swung upward from a point beneath the links of the conveyer to a position above the same, as clearly illustrated in Fig. 36 of the accompanying drawings, by reversing cams 194 to position the buckets properly, so that they will reënter the barge at the back thereof and assume an upright position as soon as they arrive at the bottom of the barge. The reversing-cams 194, which are located at opposite sides of the conveyer, are approximately L-shaped, being composed of a vertical front portion, a horizontal rear portion, and a curved intermediate portion. They are supported by suitable brackets secured to the inner or lower rails 123, and they are arranged within the paths of the cams of the buckets and are engaged by the same, whereby as the buckets travel forward they will be successively swung upwardly and rearwardly to an inclined position by the reversing-cams 194. The movement of the buckets is completed by means of a central longitudinal guide-bar 195, located midway between the pairs of rails and provided with an inclined front portion 196, arranged to engage the lower portion of each bucket after the same has been brought to an inclined position by the reversing-cams, as clearly shown in Fig. 36 of the drawings. As each bucket is drawn over the inclined portion 196 of the guide-bar it is gradually brought to an inverted position above the links of the endless conveyer, and the longitudinal guide-bar 195 receives the lips of the buckets lying below the transverse shafts of the conveyer and maintains the said buckets in an inverted position until they descend to a point where the center of gravity will maintain them in their reversed position. The longitudinal guide-bar is curved to conform

to the configuration of the adjacent portion of the conveyer, and it terminates short of the vertical back portion of the same, as the center of gravity of the buckets lying beyond the pivots or trunnions will effectually prevent the buckets from accidentally swinging to the inner side of the endless conveyer.

In order to prevent the apparatus from being injured by the backward movement of the conveyer, caused by the loaded buckets of the ascending upright flight at the front of the tower in event of the breakage of the conveyer at any point, a safety-stop 197 is employed. This safety-stop, which is preferably arranged at the intermediate horizontal flight of the conveyer, consists of an approximately rectangular frame hinged at one end and normally supported in an elevated position above the adjacent portion of the endless conveyer and adapted to be immediately tripped by the backward movement of the conveyer, whereby the latter will be securely locked against backward movement to prevent the injury which would necessarily result should the weighted buckets of the upright flight at the front of the tower be permitted to fall and drive the endless conveyer backward. The rectangular frame is composed of two side bars connected between their ends by transverse rods and provided at one end of the frame with openings for the reception of a horizontal pintle 198. The other ends of the side bars are provided with recesses or seats 199, adapted to engage one of the transverse shafts of the endless conveyer or the pivots of one of the buckets. The safety-stop is normally supported by a pivoted or hinged hanger or support 200, located at one side of the rectangular frame of the stop and provided with a suitable shoulder 201, forming a seat for one end of the adjacent transverse rod 202. The support or hanger is tripped by means of a lever 203, pivoted between its ends to the lower portion of the support or hanger and having its upper end located adjacent to a stop 204, consisting of a projection or lug extending from the said support. The lower arm of the trip-lever is arranged in the path of both the transverse shafts and the pivots or trunnions at one side of the buckets, and as the endless conveyer moves forwardly in the direction of the arrow in Fig. 37 of the drawings the lower arm of the said trip-lever will be swung in the same direction, and its upper arm will thereby be carried away from the upper stop 204. Should, however, the conveyer break at any point, the weight of the loaded buckets of the front ascending flight will force the conveyer backward, and the adjacent transverse shaft or pivot will engage the trip-lever and move the same backward. As the backward movement of the trip-lever from the position illustrated in Fig. 37, independently of the support or hanger, is prevented by the stop 204, the support or hanger will be carried backward, and the safety-stop will be caused to fall by the withdrawal of the shoulder 201 from beneath the transverse rod 202. The recessed ends of the side bars of the safety-stop will then drop into the path of the transverse shafts and the pivots of the buckets and will engage the adjacent one. The safety-stop is supported when tripped in position to engage the said shafts by a pair of chains 205 or other flexible connections secured at their ends to the rod 202 and to a suitable support. By this construction the endless conveyer in event of breakage at any part of the same will be prevented from moving backward a greater distance than approximately the length of one of the buckets, and the safety-stop will be tripped before the endless conveyer has moved backward the distance of a half of a bucket. The safety-stop by engaging one of the transverse shafts of the endless conveyer is adapted to stop the backward movement of the same before the conveyer has gained any headway, and the strain incident to such stopping or checking of the backward movement of the conveyer is sustained by both the inner and outer links, and there is no liability of the conveyer receiving any injury from its engagement with the automatically-operating safety-stop.

In order to cushion and control the movement of the sliding doors of the barge, the vertically-movable piston 44 extends through an auxiliary cylinder 206 and is provided with a piston-head 207, arranged to reciprocate in the auxiliary cylinder, which is preferably located above the main or steam cylinder 45. The ends of the auxiliary cylinder are provided with upper and lower ports, which are connected by a passage 208, at the center of which is arranged a controlling-valve 209 for constricting the longitudinal passage 208 at this point. The auxiliary cylinder is filled with a suitable cushioning liquid, such as oil, and when the piston 44 is reciprocated its movement is resisted by the oil or other liquid within the auxiliary cylinder, which liquid is forced from the cylinder at one end through the longitudinal passage to the other end of the cylinder. By regulating the controlling-valve 209 the desired cushioning action may be obtained and the necessary resistance to the reciprocation of the vertically-movable piston is produced. A longitudinal tube or pipe connection may be employed for forming the longitudinal passage for connecting the upper and lower ports of the auxiliary cylinder, or any other desired construction may be used.

The movement of the sliding doors or cut-offs of the barge is limited by means of a sliding link 210 and a pin 211 of a bracket 212 in order that the said sliding doors or cut-offs may close properly and also in order that the clutch-faces of the loose arms 16 of the longitudinal shaft 17 may be approximately in position for engagement with the sliding clutch-sections. The link 210, which may be

connected with the adjacent edge of the sliding door or cut-off 5 in any suitable manner, is disposed horizontally and preferably consists of a rod or piece of metal doubled or bent at its center to form an approximately elongated U-shaped link, as clearly illustrated in Fig. 7 of the accompanying drawings. The pin 211, which is preferably headed, projects horizontally from the bracket 212 and extends through the opening of the link 210; but a projection for this purpose may be formed in any other suitable manner and may, if desired, be integral with the bracket 212. The bracket 212, which is provided with a depending arm for supporting the projection or pin, consists of a bar or piece of metal arranged as clearly shown in Fig. 7; but it may be constructed in any other suitable manner. The depending arm of the bracket is located at one end of the latter and the other end is preferably provided with a hook 213 for engaging the bottom flange of the adjacent channel-iron beam. The bracket is secured adjacent to its depending arm to a flange of a beam by means of a bolt 214 or other suitable fastening device; but the bracket may of course be changed to suit the parts to which it may be secured. The inward or closing movement of the sliding door or cut-off is limited by the bend or outer end of the link engaging the stop of the bracket 212, and the outward or opening movement of the sliding door or cut-off is limited by the depending arm of the bracket, which is arranged to be engaged by the said sliding door or cut-off. By this construction the weight of the arm 16, which is arranged at an inclination when the sliding door or cut-off is open and closed, will not operate to slide the said door or cut-off beyond the position to which it is carried by the mechanism for rocking the shaft 17, and the sliding door or cut-off may be allowed to remain in an open or a closed position.

The main horizontal shaft 133 is provided with a ratchet-wheel 215, adapted to be engaged by an automatically-operating pawl 216 to prevent retrograde rotation of the shaft 133 incident to any backward movement of the endless conveyer. The ratchet-wheel 215 is provided at opposite sides with annular enlargements 217, arranged to receive depending arms or sides of a yoke 218, located adjacent to the engaging end of the safety-pawl 216 and preferably formed integral therewith. The pawl 216, which is capable of a limited longitudinal movement, is normally supported out of engagement with the ratchet-wheel 215 by reason of the depending portions or sides of the yoke resting upon the annular enlargements at the top thereof. The rear end of the pawl 216 is provided with a longitudinal slot 219, receiving a suitable fastening device 220, which limits the movement of the pawl. The annular enlargements, which support the pawl 216, create sufficient friction to draw the pawls 216 forward in the position shown in full lines in Fig. 41 of the accompanying drawings. The engaging end of the pawl is supported above the ratchet-teeth of the ratchet-wheel when the pawl is in the position illustrated in full lines in Fig. 41 and while the ratchet-wheel is rotating in the direction of the arrow in the said figure; but should the direction of the rotation of the shaft 133 be reversed the friction exerted by the smooth annular portions of the ratchet-wheel will carry the pawl backward to the position illustrated in dotted lines in Fig. 41 of the drawings, whereby the said shaft 133 will be locked against further movement in that direction. The safety-pawl will assist the safety-stop in preventing the endless conveyer from moving backward under the influence of the weight of the ascending upright flight, and the depending support or yoke 218 renders the pawl 216 noiseless and prevents the constant click which would result were the pawl 216 permitted to rest normally upon the teeth of the ratchet-wheel.

In order to prevent any lateral movement of the endless conveyer at the break in the rails incident to the location of the drive and guide wheels at the stern and bow of the barge, front and rear guide-plates are provided. The rear guide-plates 221, which are located at opposite sides of the conveyer at the stern of the boat, are disposed approximately horizontally, as clearly indicated in Figs. 4 and 6 of the accompanying drawings. These plates extend from the rear end of the rail 124 to the adjacent end of the upper rail 121, and they are arranged to be engaged by the ends of the transverse shafts of the endless conveyer to prevent any lateral movement whereby the wheels of the endless conveyer will be maintained in proper position to be engaged by the wheels 131, mounted at the periphery of the drive-wheels 130. These rear guide-plates also operate to hold the wheels 120 of the endless conveyer in proper position for guiding them between the upper and lower longitudinal rails 121 and 122 at the bottom of the barge, so that the flanges of the said wheels 120 will be arranged at the inner sides of the rails.

The bow of the barge is provided with upper and lower guide-plates 222 and 223, arranged in pairs and located at opposite sides of the conveyer. The lower guide-plates 223, which are disposed at a slight inclination, as clearly illustrated in Fig. 2 of the accompanying drawings, extend from the front ends of the rails at the bottom of the barge to within a short distance of the outer rails 124, and the upper plates 222, which are located adjacent to the rails 123 and 124, are disposed approximately vertically, and their lower ends are arranged at a slight inclination to form a flaring entrance or space between them to prevent their lower ends from catching on the conveyer and also to enable the latter to pass readily between them. The lower plates

prevent any lateral movement of the endless conveyer on the guide-wheels, and the upper plates serve to guide the wheels of the endless conveyer between the inner and outer rails 123 and 124.

In order to prevent the drive-wheels 130 from lifting the wheels 120 of the endless conveyer when the latter arrive at the bottom of the drive-wheel and the wheels 131 of the latter begin to ascend after actuating the endless conveyer, a centrally-arranged guard 224 is provided. This guard consists of a curved bar 225, arranged centrally over the bottom horizontal flight of the endless conveyer at the rear end of the said flight and supported by an inclined brace 226. The curved guard is arranged to be engaged by the endless conveyer, and should there be any tendency of the drive-wheel to lift the conveyer-wheels the guard will cause the latter to drop out of engagement with the drive-wheels, and there will be no liability of the endless conveyer becoming interlocked with the drive-wheel and stopping the apparatus.

The operation of the invention is as follows: After the barge has been loaded, which operation may be accomplished by any suitable means, it is towed to the vessel to be supplied with coal or other material; but it will be readily apparent that the barge may be provided with means for propelling it, if desired. After the barge has been properly positioned and anchored with relation to the vessel to be loaded the superimposed chutes are adjusted by the means before described and are arranged for delivering the coal or other material into the hold of the vessel. The chutes are capable of being varied in length and swung horizontally and vertically at either side of the barge to arrange them in such position, and they may be changed from one portion of the vessel to another, as may be found necessary or desirable. When the chutes have been properly positioned, the cut-offs of the scale-casings are arranged to cause the material to operate the scales or to pass the latter without operating them. The conveyer is then set in motion, and one of the sliding doors is opened by coupling the corresponding oscillating arm 16 to the shaft 17 by pulling upward on the operating-rod 36, which is connected with the said clutch and which may be locked in such elevated position by means of its swiveled handle or grip. The valve of the vertically-disposed steam-cylinder is reciprocated to actuate the plunger of the said cylinder and rock the shaft 17. This opens the sliding door or cut-off, and the coal begins to discharge into the buckets of the endless conveyer. The agitator corresponding with the open sliding door or cut-off may be set in motion at this time by actuating its operating mechanism, which is located adjacent to the operating-rod 36. The said sliding door and cut-off and the agitator may be operated in a very short time, as the operating mechanism of the couplings and the steam-cylinder are arranged at the deck of the barge within easy reach. The buckets as they are filled are operated on by the trimmer, which removes all the superfluous material and which is actuated by coiled springs, and these coiled springs have their tension increased by the swinging of the trimmer, and sufficient force or power may be obtained in this manner to enable the trimmer to cut off the coal should a large lump interpose itself between the buckets and the said trimmer. By this construction the buckets will be uniformly filled and there will be no liability of the material accidentally spilling from the buckets while the latter are traveling from the barge to the chutes. The doors or cut-offs of each bin or compartment of the barge may be successively opened, and as the material within a bin or compartment becomes reduced the oppositely-disposed dumping-gates, which constitute portions of the bottom of the bin, are swung upward by the hydraulic rams, which are pivotally mounted and which have their plunger pivotally connected with the dumping-gates. The reciprocating valve of the hydraulic rams is connected with operating mechanism located at the same side of the barge as the operating mechanism for controlling the couplings of the agitator and sliding-door mechanisms. As the dumping-gates are swung upward the material on them is caused to slide downward to the depending hopper portions 4 of the bin. Should the material be unevenly distributed over the dumping-gates, the compensating valves, which are connected with the rams, will vary the power and enable the same to be proportioned properly to the load to be lifted by the respective rams. After one compartment has been emptied the dumping-gates are returned to their normal position, the sliding doors are closed, and the agitators are stopped. The other bins are successively operated in this manner until the entire load of the barge is transferred to the vessel being loaded or until the desired quantity has been supplied. The buckets laden with coal or other material ascend the tower at the front side or leg thereof, and those buckets which carry the projections or enlargements of the cams engage the first set of dumping-blocks and are inverted to discharge their contents into the scale-casing of the front chute. The front set of dumping-blocks are spaced farther apart than the rear ones, and those buckets which are not provided with the projections or enlargements of the cams pass between the front set of dumping-blocks and are not affected by the same; but when they arrive at the rear set of dumping-blocks they are tilted and caused to discharge their contents into the scale-casing of the rear chute. Each of the buckets is operated by the second set of dumping-blocks; but as every other bucket has been emptied before they arrive at the second set of dumping-blocks it will be ap-

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parent that this will not affect the uniform distribution of the material to the front and rear chutes. The empty buckets descend at the rear side or leg of the tower, and they travel rearward to the stern of the barge, passing over the rear portion of the latter. As they arrive at the back of the conveyer they are automatically carried from a position beneath the intermediate rearwardly-extending flight of the conveyer to a point above the same by the reversing-cams, as illustrated in Fig. 35 of the drawings, and they are held in this position by the longitudinal guide-bar until the center of gravity of the buckets by reason of their movement downward and rearward is carried beyond the pivots, so that the buckets will be held at the outer side of the rear portion of the conveyer by gravity. The buckets when at the outer side of the rear portion of the conveyer are in proper position for entering the chute, and they will thereby lie below the bottom horizontal flight of the endless conveyer and be in proper position to receive another charge of material. As the loaded buckets ascend at the front of the tower the conveyer in event of a breakage at any point will be forced backward by the weight of the material in the buckets of the front ascending flight, and in order to prevent the conveyer from moving backward any distance under the influence of this weighted upright flight the safety-stop, which is clearly illustrated in Fig. 37, is provided. The tripping mechanism of the safety-stop is operated by the backward movement of the conveyer, and the safety-stop will immediately check this backward movement before this weighted front flight has had the slightest opportunity to effect any injury.

The apparatus requires only a very few hands to operate it, as the only parts requiring attention are the engine and the devices for controlling the sliding doors, the agitators, and the dumping-gates after the chutes have been properly positioned.

What I claim is—

1. In an apparatus for handling material in bulk, the combination of a barge, a superimposed chute capable of movement to arrange it in the desired position, an endless conveyer extending from the barge to the chute and having an upright flight for conveying the material from the barge to the chute, and an automatically-operating safety-stop arranged above one of the flights of the conveyer and being normally out of engagement with the same and capable of operation solely by the backward movement of the conveyer, whereby it will be dropped to its engaging position, substantially as described.

2. In an apparatus for handling material in bulk, the combination of a barge, a tower, a superimposed extensible chute suspended from the tower and having a hinge and swivel connection therewith, whereby it is capable of both vertical and horizontal oscillation and is adapted to swing both transversely and longitudinally of the barge to enable it to be arranged at either side thereof and to extend forward and aft, and a conveyer extending from the barge to the chute, substantially as described.

3. The combination of a barge, a tower, a pair of horizontally-swinging supporting-booms arranged at opposite sides of the tower, a superimposed chute capable of movement to arrange it in the desired position, means for connecting the chute with either of the booms, and a conveyer extending from the barge to the chute, substantially as described.

4. In an apparatus for handling material in bulk, the combination of a barge provided with a support or tower, a superimposed chute depending from the support or tower and arranged to swing vertically and horizontally, a boom hinged to the tower or support and located above the chute and arranged to swing horizontally, adjustable connections supporting the chute from the boom, and a conveyer extending from the barge to the chute, substantially as described.

5. In an apparatus for handling material in bulk, the combination of a barge having a tower, a superimposed chute suspended from the support or tower and arranged to swing transversely and longitudinally of the barge, whereby it is adapted to be arranged in any direction at either side of the said barge, the booms located at opposite sides of the tower or support and arranged to swing horizontally to enable it to move with the chute when the latter swings longitudinally of the barge, connections depending from the booms and detachably engaging the chute, whereby the latter may be supported from either boom to arrange it at either side of the barge, and a conveyer extending from the barge to the support or tower and passing over the chute, substantially as described.

6. In an apparatus for handling material in bulk, the combination of a barge having a support or tower, a pair of extensible chutes suspended from the support or tower and arranged to swing through the same transversely of the barge to either side of the latter and capable also of swinging longitudinally of the barge, a pair of booms hinged to the support or tower and arranged to swing horizontally to move with the chutes when the latter swing longitudinally of the barge, the adjustable connections between the booms and the chutes, and a conveyer extending from the barge to the chutes, substantially as described.

7. In an apparatus for handling material in bulk, the combination of a barge having a support or tower, the superimposed chutes suspended from the support or tower and arranged to swing through the same transversely of the barge and capable also of swinging longitudinally of the barge, the booms arranged in pairs at opposite sides of the barge and hinged to the support or tower and arranged to swing horizontally to enable them

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to move with the chutes when the latter swing longitudinally of the barge, means for adjustably and detachably connecting the chutes with the booms, whereby the chutes are adapted to be supported at either side of the barge, and a conveyer extending from the barge to the chutes, substantially as described.

8. In an apparatus for handling material in bulk, the combination of a barge, a tower, a pair of horizontally-swinging booms mounted on the tower and located at opposite sides of the barge, a vertically and horizontally swinging chute mounted on the tower and adapted to be swung forward and rearward and laterally to either side of the barge to arrange it beneath either boom, and means for connecting the chute to either of the booms, substantially as described.

9. The combination of a barge, a support or tower mounted on the barge and provided with an opening, a superimposed chute depending from the top of the support or tower at the said opening and arranged to swing through the same transversely of the barge to carry it to either side of the latter, and capable also of swinging longitudinally of the barge, means for supporting the chute in its adjusted position, and a conveyer extending from the barge to the support or tower and passing over the chute, substantially as described.

10. In an apparatus for handling material in bulk, the combination of a barge provided with bins or compartments and having cut-offs at the bottoms thereof, a superimposed chute, a conveyer extending from the barge to the chute and passing beneath the said bins or compartments, a shaft extending longitudinally of the barge, a series of arms loosely mounted on the shaft and connected with the cut-offs, couplings arranged at intervals for connecting the arms to the shaft, and means for operating the couplings independently of one another, whereby one or more of the cut-offs may be operated by the shaft, substantially as described.

11. In an apparatus for handling material in bulk, the combination of a barge having bins or compartments provided with cut-offs, a superimposed chute, a conveyer extending from the barge to the chute and having a flight located beneath the bins or compartments, a longitudinal shaft, independent connections between the cut-offs and the shaft, and means for operating such connections independently of one another, whereby one or more of the cut-offs may be operated, substantially as described.

12. In an apparatus for handling material in bulk, the combination of a barge provided with a series of cut-offs, a movable chute located above the barge, a conveyer extending from the barge to the chute and arranged adjacent to the cut-offs, a shaft, a series of arms loosely mounted on the shaft and connected with the cut-offs, couplings for locking the arms rigid with the shaft, means for operating the couplings independently of one another, and a steam-cylinder having a piston connected with and adapted to rock the shaft, substantially as described.

13. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a series of movable cut-offs, a movable chute located above the barge, an endless conveyer extending from the barge to the chute and arranged to receive material from the cut-offs, a shaft, a series of arms loosely mounted on the shaft and connected with the cut-offs, couplings for locking the arms to the shaft, a steam-cylinder connected with and adapted to rock the shaft, and operating mechanism extending from the couplings and from the steam-cylinder to the deck of the barge, substantially as and for the purpose described.

14. In an apparatus for handling material in bulk, the combination of a barge provided with a longitudinal series of bins or compartments and having movable cut-offs, a movable chute located above the barge, a conveyer extending from the barge to the chute and arranged to receive material from the cut-offs, a longitudinal shaft arranged at one side of the conveyer, a series of arms loosely mounted on the longitudinal shaft and connected with the cut-offs, couplings for locking the arms to the longitudinal shaft, a series of agitators, the short longitudinal shafts carrying the agitators, the long longitudinal tongue-shaft connected by gearing with the short shafts, couplings for connecting the said gearing with the counter-shaft, and operating mechanism located at one side of the barge and extending to all of the said couplings and adapted to enable them to be independently operated, substantially as described.

15. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a series of movable cut-offs, a movable chute located above the barge, an endless carrier extending from the barge to the chute, a longitudinal rock-shaft provided with a rigid arm and having a series of loosely-mounted arms connected with the cut-offs, couplings for locking the arms to the rock-shaft, a steam-cylinder having a piston connected with the rigid arm of the rock-shaft, and operating mechanism for controlling the couplings and the steam-cylinder whereby one or more of the cut-offs may be opened and closed, substantially as described.

16. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with dumping-gates, a superimposed chute, a conveyer extending from the barge to the chute, a series of hydraulic rams connected with the dumping-gates and capable of movement to conform to the movement of the said dumping-gates, and means for operating the rams

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to raise and lower the dumping-gates independently of one another, substantially as described.

17. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a series of dumping-gates, a superimposed chute, a conveyer extending from the barge to the chute, a series of pivotally-mounted hydraulic rams located beneath and connected with the dumping-gates and capable of movement to adjust themselves to the movement of the said dumping-gates, and means for operating the rams for raising and lowering the dumping-gates independently of one another, substantially as described.

18. In an apparatus for handling material in bulk, the combination of a barge having a bin and provided with a series of dumping-gates arranged to swing upward and downward, a superimposed chute, a conveyer extending from the barge to the chute, a series of movably-mounted hydraulic rams located beneath and pivotally connected with the dumping-gates, and means for operating the rams to open and close the dumping-gates independently of each other, substantially as described.

19. In an apparatus for handling material in bulk, the combination of a barge having a bin and provided with a dumping-gate, a movable chute located above the barge, a conveyer extending from the barge to the chute, a pair of hydraulic rams located beneath and connected with the dumping-gate at opposite sides thereof, and a compensating valve connected with the hydraulic rams and adapted to vary the power of the same to enable the dumping-gate to be uniformly raised, substantially as and for the purpose described.

20. In an apparatus for handling material in bulk, the combination of a barge provided with bins or compartments and having oppositely-disposed upwardly-swinging dumping-gates, the hydraulic rams arranged in pairs and located beneath and connected with the dumping-gates, and compensating valves connected with the hydraulic rams and with the dumping-gates and operated by the latter to vary the power to suit the load to be lifted, substantially as and for the purpose described.

21. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a dumping-gate, a movable chute located above the barge, a conveyer extending from the barge to the chute, a pair of hydraulic rams connected with the dumping-gate at opposite sides thereof, a compensating valve connected with the hydraulic rams and adapted to vary the power of the same, and flexible connections between the valve and the opposite sides of the dumping-gate for controlling the action of the valve to proportion the power to the weight to be lifted by the rams, substantially as described.

22. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a dumping-gate, a movable chute located above the barge, a conveyer extending from the barge to the chute, a pair of hydraulic rams connected with the dumping-gate at opposite sides thereof, a compensating valve for controlling the feed or supply of liquid to the rams to vary the power thereof, flexible connections extending from the compensating valve to the opposite sides of the dumping-gate, and a weight for holding the flexible connections taut, substantially as described.

23. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a dumping-gate, hydraulic rams connected with the dumping-gate and arranged at opposite sides thereof, a movable chute located above the barge, a conveyer extending from the barge to the chute, a compensating valve connected with the rams for controlling the feed to the same to vary the power of the rams, flexible connections extending from the valve to the opposite sides of the dumping-gate and provided with similar loops, guide-pulleys receiving the flexible connections, and a weight supported by the said loops and having pulleys for the reception of the same, substantially as described.

24. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a dumping-gate, a chute, a conveyer extending from the barge to the chute, a pair of hydraulic rams located beneath and connected with the dumping-gate at opposite sides thereof, an oscillatory compensating valve for controlling the feed to the hydraulic rams, the central guide-pulley 106, the guide-pulleys 105 located adjacent to the sides of the dumping-gate, the pulleys 107 located at opposite sides of the central pulley 106, the flexible connections secured at their outer ends to the dumping-gate near the side edges thereof and extending from the pulleys 105 to the central pulley 106 and provided with loops depending from the pulleys 106 and 107, said flexible connections being attached at their inner ends to the compensating valve, and a weight supported by the said loops, substantially as described.

25. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment provided with a dumping-gate arranged to swing upward and downward, hydraulic rams movably mounted beneath the dumping-gate and connected with the same and capable of yielding to the upward-and-downward swinging movement of the said dumping-gate, and means operated by the dumping-gate for varying the power of the rams, substantially as described.

26. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment provided with a hinged

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dumping-gate arranged to swing upward and downward, hydraulic rams movably mounted beneath the dumping-gate and having plungers connected with and adapted to raise the said dumping-gate, said rams being adapted to adjust themselves to the swinging movement of the dumping-gate, and means for operating the rams, substantially as described.

27. In an apparatus for handling material in bulk, the combination of a barge having a bin provided with a hinged dumping-gate, a pair of movably-mounted hydraulic rams located beneath and connected with the dumping-gate and capable of yielding to the swinging movement thereof, and means for connecting the rams with the dumping-gate for automatically varying the power of the rams to adapt the same to the disposition of the material on the gate, substantially as described.

28. In an apparatus for handling material in bulk, the combination of a barge having a bin provided with a hinged dumping-gate, a pair of movably-mounted hydraulic rams located at opposite sides of the dumping-gate and capable of yielding to the swinging movement of the latter, and a compensating valve connected with and adapted to vary the power of the rams, substantially as described.

29. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a dumping-gate, a pair of oppositely-disposed hydraulic rams connected with the dumping-gate and adapted to actuate the same, a compensating valve connected with the hydraulic rams and adapted to vary the power of the same, and means connected with the gate for controlling the valve, substantially as and for the purpose described.

30. In an apparatus for handling material in bulk, the combination of a barge provided with bins or compartments and having oppositely-disposed upwardly-swinging dumping-gates, a chute, an endless conveyer extending from the barge to the chute and having one of its flights located beneath the dumping-gates, the hydraulic rams arranged in pairs and located beneath and connected with the dumping-gates, and compensating valves connecting the members of each pair of hydraulic rams and also connected with the dumping-gates and adapted to vary the power of the rams to correspond with the disposition of the material on the gates, substantially as described.

31. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment provided with a dumping-gate, a pair of hydraulic rams connected with the dumping-gate at opposite sides thereof, a compensating valve connected with the hydraulic rams and adapted to vary the power of the same, and flexible connections between the valve and the opposite sides of the gate for controlling the valve for varying the power to arrange the same to correspond with the disposition of the load, substantially as described.

32. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a dumping-gate, a pair of hydraulic rams connected with the dumping-gate, a compensating valve for controlling the feed or supply of liquid to the rams to vary the power thereof, flexible connections between the compensating valve and the gate, and a weight for holding the flexible connections taut, substantially as described.

33. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a dumping-gate, hydraulic rams connected with the dumping-gate and arranged at opposite sides thereof, a compensating valve connected with and adapted to vary the power of the rams, flexible connections extending from the valve to the opposite sides of the dumping-gate and provided with similar depending loops, guides receiving the flexible connections, and a weight supported by the said loops, substantially as described.

34. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a dumping-gate, a pair of hydraulic rams located beneath and connected with the dumping-gate at opposite sides thereof, an oscillatory compensating valve for varying the power of the rams, the central guide-pulley 106, the guide-pulleys 105 located adjacent to the side edges of the dumping-gate, the pulleys 107 arranged at opposite sides of the central pulley 106, the flexible connections secured at their outer ends to the dumping-gate, near the side edges thereof and extending from the pulleys 105 to the pulley 106 and provided with opposite depending loops extending downward from the pulleys 106 and 107, said flexible connections being connected at their inner ends with the compensating valve, and a weight supported by the loops, substantially as described.

35. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a swinging dumping-gate, a pair of pivotally-mounted hydraulic rams having their pistons pivoted to the dumping-gate at opposite sides thereof and the oscillatory compensating valve connected with the opposite sides of the dumping-gate and adapted to vary the power of the rams, substantially as and for the purpose described.

36. In an apparatus for handling material in bulk, the combination of a barge having a bin or compartment and provided with a swinging dumping-gate, a pair of pivotally-mounted hydraulic rams having their pistons pivoted to the dumping-gate at opposite sides thereof, the oscillatory compensating valve adapted to vary the power of the rams and provided with an exterior head, and connections between the head and the dumping-gate, whereby the power is varied to correspond

with the disposition of the load, substantially as described.

37. In an apparatus for handling material in bulk, the combination of a barge, a tower, a superimposed chute suspended from the tower and capable of movement to arrange it in the desired position, horizontally-swinging supporting-booms arranged at opposite sides of the tower, adjustable connections depending from the booms and provided with means for detachably suspending the chute from the booms, whereby the chute may be arranged beneath and connected with either boom, and a conveyer extending from the barge to the chute, substantially as described.

38. In an apparatus for handling material in bulk, the combination of a barge, a tower, a chute depending from the tower and capable of movement to arrange it in the desired position, horizontally-swinging booms arranged at opposite sides of the tower, flexible connections depending from the booms and adapted to be connected with the chute to support the same at either side of the barge, and a winch having drums adapted to receive the flexible connections at either side of the tower, substantially as described.

39. In an apparatus for handling material in bulk, the combination of a barge, a tower arranged at the front of the barge and having an opening, an endless conveyer provided with buckets and consisting of a bottom horizontal flight located within the barge, the ascending and descending upright flights mounted on the tower, and the rearwardly-extending intermediate flight connecting the descending upright flight with the rear end of the bottom horizontal flight, a chute depending from the tower and arranged to swing through the same and through the conveyer to carry it from one side of the barge to the other, dumping mechanism for inverting the buckets to discharge their contents into the chute, and reversing mechanism located at the rearwardly-extending intermediate flight of the conveyer and adapted to swing the buckets from beneath the intermediate rearwardly-extending flight to a point above the same, whereby the buckets are caused to enter the barge in proper position to receive another charge, substantially as described.

40. In an apparatus for handling material in bulk, the combination of a barge, a tower mounted on the barge, an endless conveyer provided with buckets and having ascending and descending flights located in advance and in rear of the tower, a chute located beneath the top of the conveyer and arranged to swing through the same and supported by the tower, dumping mechanism arranged at the top of the tower, a safety-stop located between the tower and the stern of the barge and normally held out of engagement with the conveyer, and means for reversing the buckets before the same reënter the barge, substantially as described.

41. In an apparatus for handling material in bulk, the combination of a barge, a tower arranged at the front of the barge and having an opening, an endless conveyer provided with buckets and consisting of a bottom flight located within the barge, the ascending and descending upright flights supported by the tower, and the rearwardly-extending intermediate flight connecting the descending flight with the rear end of the bottom flight, a chute supported by the tower and arranged to swing through the same and through the conveyer, dumping mechanism for inverting the buckets to discharge their contents into the chute, a reversing-cam arranged at the back of the endless conveyer and adapted to swing the buckets from their position beneath the intermediate flight to a point above the same, whereby the buckets are caused to enter the barge in proper position to receive another charge, substantially as described.

42. In an apparatus for handling material in bulk, the combination of a barge provided with a longitudinal series of bins or compartments, a tower arranged at the front of the barge and having an opening, an endless conveyer provided with buckets and consisting of a bottom flight located within the barge and extending beneath the bins or compartments, the upright ascending and descending flights supported by the tower, and the rearwardly-extending intermediate flight, a chute supported by the tower and arranged to swing through the tower and through the conveyer, dumping mechanism for discharging the contents of the buckets into the chute, drive-wheels located at the stern of the barge and engaging the endless conveyer, guide-wheels arranged at the bow of the barge, a longitudinal guide-bar located beneath the bins or compartments and arranged to engage the buckets, whereby the latter are rigidly maintained in a horizontal position to prevent them from being accidentally oscillated when the material is discharged into them, and means for rotating the drive-wheels, substantially as described.

43. In an apparatus for handling material in bulk, the combination of a barge having bins or compartments and provided at the bottoms thereof with independent cut-offs, a tower having an opening, an endless conveyer provided with pivoted buckets and consisting of a bottom flight arranged beneath the bins or compartments, the ascending and descending upright flights supported by the tower, and the rearwardly-extending intermediate flight, a chute arranged to swing through the tower and through the endless conveyer, dumping mechanism for discharging the contents of the buckets into the chute, a reversing-cam located at the back of the endless conveyer and adapted to swing the buckets from their position beneath the intermediate flight to a point above the same for causing the buckets to enter the barge in proper position to receive another charge, and means

for operating the cut-offs independently of one another and for locking them in their open position, substantially as and for the purpose described.

44. In an apparatus for handling material in bulk, the combination of a barge having bins or compartments provided with lower cut-offs and having oppositely-disposed dumping-gates, a tower, an endless conveyer provided with pivoted buckets and consisting of a bottom flight located within the barge and arranged beneath the bins or compartments, the upright ascending and descending flights supported by the tower, and the intermediate rearwardly-extending flight, a chute supported by the tower, dumping mechanism located at the top of the tower for discharging the contents of the buckets into the chute, a reversing-cam arranged at the back of the intermediate rearwardly-extending flight of the conveyer and adapted to swing the buckets from a position beneath the conveyer to a point above the same, operating mechanism for opening and closing the cut-offs independently of one another, and hydraulic rams for actuating the dumping-gates, substantially as described.

45. In an apparatus for handling material in bulk, the combination of a barge having bins or compartments provided with cut-offs and having dumping-gates, a tower having an opening, an endless conveyer provided with pivoted buckets and consisting of a bottom flight arranged beneath the bins or compartments, and upright ascending and descending flights located at the front and back of the tower and supported by the same, a chute depending from the top of the tower and arranged to swing through the same and through the endless conveyer, dumping mechanism located at the top of the tower, a reversing-cam arranged at the back of the barge for changing the position of the buckets before the same enter the barge, operating mechanism for opening and closing the cut-offs independently of one another, hydraulic rams arranged in pairs and connected with the dumping-gates, and compensating valves connecting the rams of each pair, substantially as and for the purpose described.

46. In an apparatus for handling material in bulk, the combination of a barge having bins or compartments provided with cut-offs and having dumping-gates, a tower having an opening, an endless conveyer provided with pivoted buckets and consisting of a bottom flight located beneath the bins or compartments and upright ascending and descending flights supported by the tower and arranged at the front and back of the same, a chute depending from the top of the tower and arranged to swing through the same and through the endless conveyer, dumping mechanism arranged at the top of the tower, a reversing-cam located at the back of the barge for changing the position of the buckets before they reënter the said barge, operating mechanism for opening and closing the cut-offs independently of one another, hydraulic rams connected with and adapted to actuate the dumping-gates, and trimmers arranged at intervals above the bottom flight of the endless conveyer to remove the surplus material from the buckets, substantially as described.

47. In an apparatus for handling material in bulk, the combination of a barge having bins or compartments provided with cut-offs and having dumping-gates, a tower having an opening, an endless conveyer provided with pivoted buckets and consisting of a bottom flight located beneath the bins or compartments, and upright ascending and descending flights supported by the tower and arranged at the front and back of the same, chutes depending from the top of the tower and arranged to swing through the same and through the endless conveyer, dumping mechanism located at the top of the tower, a winch, flexible connections extending from the winch to the chutes and located at opposite sides of the tower, operating mechanism for opening and closing the cut-offs, hydraulic rams connected with the dumping-gates, and means for operating the rams for opening and closing the dumping-gates independently of one another, substantially as described.

48. In an apparatus for handling material in bulk, the combination of a barge having bins or compartments provided with cut-offs and having dumping-gates, a tower mounted on the barge and having an opening, an endless conveyer provided with pivoted buckets and consisting of a bottom flight located beneath the bins or compartments, and upright ascending and descending flights supported by the tower and arranged at the front and back of the same, operating mechanism for opening and closing the cut-offs, hydraulic rams connected with the dumping-gates, the movable chutes depending from the top of the tower and arranged to swing through the same and through the endless conveyer, a winch, flexible connections extending from the winch to the chutes and located at opposite sides of the tower, dumping mechanism located at the top of the tower, and a reversing-cam arranged to change the position of the buckets before the latter enter the barge, substantially as described.

49. In an apparatus for handling material in bulk, the combination of a barge provided with bins or compartments having cut-offs and provided with dumping-gates, a tower mounted on the barge and having an opening, an endless conveyer having pivoted buckets and consisting of a bottom flight located beneath the bins or compartments, and upright ascending and descending flights supported by the tower and located at the front and back of the same, chutes depending from the top of the tower and arranged to swing through the same and through the endless conveyer, a winch having a series of drums, flexible

connections located at opposite sides of the tower and extending from the chutes to the drums, operating mechanism for opening and closing the cut-offs independently of one another, dumping mechanism arranged at the top of the tower, a reversing-cam for changing the position of the buckets, a safety-stop located above one of the flights of the conveyer and normally held out of contact with the same, and a trimmer for removing the surplus material, substantially as described.

50. In an apparatus for handling material in bulk, the combination of a barge having bins or compartments provided with cut-offs, a superimposed chute, a conveyer extending from the barge to the chute, a shaft extending longitudinally of the bins or compartments, a series of arms connected with the cut-offs, means for coupling the arms to the shaft, whereby one or more of the cut-offs may be opened and closed when the shaft is actuated, stops arranged in pairs for limiting the inward and outward movement of the cut-offs, and means for rocking the shaft, substantially as described.

51. In an apparatus for handling material in bulk, the combination with a conveyer, of bins or compartments having cut-offs, a shaft, a series of arms connected with the cut-offs, devices for coupling the arms to the shaft, brackets, the links slidably connected with the brackets and having their inward movement limited by the same to limit the inward movement of the cut-offs, and means for rocking the shaft, substantially as described.

52. In an apparatus for handling material in bulk, the combination of bins or compartments, an endless conveyer having a bottom flight located beneath the bins or compartments, cut-offs arranged at the bottom of the bins or compartments, a series of arms loosely mounted and arranged at an inclination and connected with the cut-offs, a shaft, couplings for connecting the arms with the shaft, links extending from the cut-offs and provided with openings, and the brackets provided with projections extending into the openings of the links, whereby the latter are slidably connected with the brackets to limit the inward and outward movement of the cut-offs, substantially as described.

53. In an apparatus for handling material in bulk, the combination of a barge, a superimposed chute, an endless conveyer extending from the barge to the chute and passing over the same and permitting the chute to swing through it from one side of the barge to the other, said conveyer being provided with a bottom flight located within the barge, a drive-wheel engaging the conveyer at one end of the bottom flight, and a guard-arm located above the bottom flight, adjacent to the drive-wheel and arranged to be engaged by the conveyer to free the latter, substantially as described.

54. In an apparatus for handling material in bulk, the combination of a barge, an endless conveyer having pivoted buckets and provided with wheels, drive-wheels arranged to receive and engage the wheels of the conveyer, and a guard located above one of the flights of the conveyer and arranged between the drive-wheels in position to be engaged by the conveyer as the buckets leave the drive-wheel, whereby the said conveyer will be freed from its engagement with the drive-wheel, substantially as described.

55. In an apparatus for handling material in bulk, the combination of a barge, a superimposed chute, an endless conveyer provided with pivoted buckets and having wheels, drive-wheels arranged to engage the wheels of the conveyer, and a guard extending longitudinally of the adjacent flight of the conveyer and located between the drive-wheels and arranged to be engaged by the said conveyer to free the same from the said drive-wheels, substantially as described.

56. In an apparatus for handling material in bulk, the combination of a barge, a superimposed chute, an endless conveyer provided with wheels, drive-wheels engaging the wheels of the conveyer, rails receiving the wheels of the conveyer and spaced from the drive-wheels, and guide-plates located at opposite sides of the conveyer and connecting the rails and adapted to hold the endless conveyer against lateral movement, substantially as described.

57. In an apparatus for handling material in bulk, the combination of a barge, an endless conveyer provided with wheels, guide-wheels receiving the wheels of the conveyer, a superimposed chute, rails extending from opposite sides of the guide-wheels and arranged to receive the wheels of the conveyer, and the guide-plates located at opposite sides of the conveyer adjacent to the guide-wheels and adapted to hold the conveyer against lateral movement, substantially as described.

58. In an apparatus for handling material in bulk, the combination of a barge, a superimposed chute, a conveyer having an ascending flight and provided with wheels, guide-wheels located at the lower end of the ascending flight of the conveyer, rails arranged in pairs and extending from the top and bottom of the guide-wheels, and the upper and lower guide-plates arranged adjacent to the guide-wheels and adapted to hold the conveyer against lateral movement on the guide-wheels, and capable of guiding the conveyer-wheels to the rails, substantially as described.

59. In an apparatus for handling material in bulk, the combination of a bin or compartment, a superimposed chute, an endless conveyer having an ascending flight for conveying material upward from the bin or compartment to the chute, said conveyer being also provided with a horizontal flight, and a safety-stop located above and normally held out of contact with the upper horizontal flight of the endless conveyer, and arranged to be thrown into engagement by the backward

movement of the conveyer and capable of locking the same against such backward movement after it engages the same, substantially as described.

60. In an apparatus for handling material in bulk, the combination of a bin or compartment having a series of movable cut-offs, an endless conveyer, a chute, a shaft extending longitudinally of the series of cut-offs, loosely-mounted arms arranged on the shaft and connected with the cut-offs, couplings for locking the arms to the shaft, a steam-cylinder connected with and adapted to rock the shaft, and operating mechanism for controlling the said couplings, substantially as described.

61. In an apparatus for handling material in bulk, the combination with a bin or compartment, a superimposed chute, and a conveyer extending from the bin or compartment to the chute, of a dumping-gate arranged to swing upward and downward, hydraulic rams for actuating the dumping-gate, and a compensating valve connected with the rams, substantially as described.

62. In an apparatus for handling material in bulk, the combination of a longitudinal series of bins or compartments provided with hinged dumping-gates, a chute, a conveyer extending from the bins or compartments to the chute, hydraulic rams arranged in pairs and connected with the dumping-gates and capable of yielding to the swinging movement of the same, compensating valves connecting the rams of each pair, and means for automatically operating the compensating valves to vary the power of the rams to correspond to the disposition of the material on the dumping-gates, substantially as described.

63. In an apparatus for handling material in bulk, the combination of a series of bins or compartments provided with dumping-gates, hydraulic rams arranged in pairs, compensating valves connecting the rams, and connections between the compensating valves and the dumping-gates, substantially as and for the purpose described.

64. In an apparatus for handling material in bulk, the combination of a bin or compartment having a sliding cut-off or door, a conveyer, a shaft, an arm loosely mounted on the shaft and connected with the cut-off or door, means for connecting the arm with the shaft and for operating the latter, a link connected with the door or cut-off, and means for engaging the link to limit the inward and outward movement of the sliding door or cut-off, substantially as described.

65. In an apparatus for handling material in bulk, the combination of an endless conveyer, a drive-wheel engaging the endless conveyer, and the guard comprising an approximately horizontal bar located above the endless conveyer, and a brace extending upward from the bar, substantially as described.

66. In an apparatus for handling material in bulk, the combination of a bin or compartment, an endless conveyer provided with wheels, rails receiving the wheels of the conveyer, drive-wheels interposed between the rails, and guide-plates for holding the endless conveyer against lateral movement, substantially as described.

67. In an apparatus for handling material in bulk, the combination of a conveyer provided with wheels, a longitudinal series of bins or compartments, drive and guide wheels located at the ends of the series of bins or compartments, rails spaced from the drive and guide wheels and receiving the wheels of the conveyer, a guard located between the drive-wheels and arranged above the conveyer and adapted to free the same from the said drive-wheels as the buckets leave the latter, and guide-plates located at the spaces between the rails adjacent to the drive and guide wheels and holding the conveyer against lateral movement, whereby the wheels of the conveyer are guided to the rails, substantially as described.

68. In an apparatus for handling material in bulk, the combination of a barge having a tower, the front and rear chutes depending from the tower, an endless conveyer provided with pivoted buckets and having one of its flights located above the chutes, the scale-casings mounted above the chutes and provided each with a pair of rigid spouts and having a movable cut-off for closing either of the spouts, and the front and rear dumping-blocks mounted on the scale-casings and arranged to discharge the contents of the buckets alternately in the front and rear scale-casings, substantially as described.

69. In an apparatus for handling material in bulk, the combination of a barge, a tower composed of front and rear legs and a connecting top portion, an endless conveyer having pivoted buckets and consisting of a bottom horizontal flight located within the barge at the bottom thereof, the front ascending flight adapted to carry material upward from the barge, the rear descending flight connected with the said flights and located at the back of the tower, a movable chute depending from the top of the tower and arranged to swing through the same, a scale-casing mounted within the top of the tower and located above the chute, a dumping-block arranged at the top of the scale-casing and adapted to be engaged by the pivoted buckets, and a reversing-cam to change the position of the buckets as the latter enter the barge, substantially as described.

70. In an apparatus for handling material in bulk, the combination of a barge, a tower composed of front and rear legs and a connecting top portion, an endless conveyer having pivoted buckets and consisting of a bottom horizontal flight located within the barge at the bottom thereof, the front ascending flight adapted to carry material upward from the barge, the rear descending flight connected with the said flights and located at the back of the tower, a movable chute depending from

the top of the tower and arranged to swing through the same, a scale-casing mounted within the top of the tower and located above the chute, a dumping-block arranged at the top of the scale-casing and adapted to be engaged by the pivoted buckets, and a trimmer arranged within the barge and arranged above the bottom flight of the conveyer, substantially as described.

71. In an apparatus for handling material in bulk, the combination of a barge, a tower composed of front and rear legs and a connecting top portion, an endless conveyer having pivoted buckets and consisting of a bottom horizontal flight located within the barge at the bottom thereof, the front ascending flight adapted to carry material upward from the barge, the rear descending flight connected with the said flights and located at the back of the tower, a movable chute depending from the top of the tower and arranged to swing through the same, a scale-casing mounted within the top of the tower and located above the chute, a dumping-block arranged at the top of the scale-casing and adapted to be engaged by the pivoted buckets, a reversing-cam arranged at the back of the barge to change the position of the buckets as the latter enter the said barge, and a trimmer arranged within the barge at the bottom thereof and located above the bottom flight of the conveyer, substantially as described.

72. In an apparatus for handling material in bulk, the combination of a barge, a tower composed of front and rear legs and a connecting top portion, an endless conveyer having pivoted buckets and consisting of a bottom horizontal flight located within the barge at the bottom thereof, the front ascending flight adapted to carry material upward from the barge, the rear descending flight connected with the said flights and located at the back of the tower, a movable chute depending from the top of the tower and arranged to swing through the same, a scale-casing mounted within the top of the tower and located above the chute, a dumping-block arranged at the top of the scale-casing and adapted to be engaged by the pivoted buckets, a drive-wheel located within the barge at the bottom thereof, and a guard located within the barge adjacent to the drive-wheel and arranged above the bottom flight of the conveyer, substantially as described.

73. In an apparatus for handling material in bulk, the combination of a barge, a tower composed of front and rear sides or legs and having a top connecting portion, a chute depending from the top of the tower, the endless conveyer provided with buckets and consisting of a bottom horizontal flight located within the barge, the ascending and descending upright flights, and the rearwardly-extending intermediate flight connecting the descending upright flight, the drive and guide wheels arranged within the barge at the ends of the horizontal bottom flight, and the guard located above the bottom flight and arranged adjacent to the drive-wheel, substantially as described.

74. In an apparatus for handling material in bulk, the combination of a barge, a tower composed of front and rear sides or legs and having a top connecting portion, a chute depending from the top of the tower, the endless conveyer provided with buckets and consisting of a bottom horizontal flight located within the barge, the ascending and descending upright flights, and the rearwardly-extending intermediate flight, the drive and guide wheels located within the barge at the stern and bow of the same, and the guide-plates located at opposite sides of the conveyer at the ends of the horizontal flight and arranged adjacent to the said wheels and adapted to hold the conveyer against lateral movement, substantially as described.

75. In an apparatus for handling material in bulk, the combination of a barge, a tower, an endless conveyer provided with buckets and having a horizontal flight arranged within the barge at the bottom thereof, said conveyer extending to the top of the tower, the guide and drive wheels arranged at the bow and stern of the barge at the ends of the horizontal flight of the conveyers, the guide-plates located at opposite sides of the horizontal flight of the conveyer and adapted to prevent the same from moving laterally, and the guard arranged within the barge at the stern thereof and located above the horizontal flight of the conveyer adjacent to the drive-wheel, substantially as described.

76. In an apparatus for handling material in bulk, the combination of a barge, a tower, an endless conveyer provided with buckets and extending from the barge to the tower and having a horizontal flight arranged within the barge at the bottom thereof, said conveyer being provided at opposite sides with wheels, the drive and guide wheels arranged in pairs and located within the barge at the ends of the horizontal flight of the conveyer, rails spaced from the drive and guide wheels and receiving the wheels of the conveyer, and the guard-plates located at the spaces between the rails adjacent to the drive and guide wheels and holding the conveyer against lateral movement, substantially as described.

77. In an apparatus for handling material in bulk, the combination of a tower, a chute depending from the tower, an endless conveyer extending from the barge to the tower and having a horizontal flight located within the barge at the bottom thereof, said conveyer being also provided at opposite sides with wheels, drive and guide wheels located within the barge at the ends of the horizontal bottom flight of the conveyer, the rails spaced from the guide and drive wheels, the guide-plates located at the spaces between the rails and holding the conveyer against lateral movement at the guide and drive wheels, and a

guard located above the bottom flight of the conveyer and arranged between the drive-wheels, substantially as described.

78. In an apparatus for handling material in bulk, the combination of a barge, a tower, movable chutes depending from the tower and composed of extensible sections, the booms hinged to the tower and located above the chutes, an endless conveyer extending from the barge to the chutes, the flexible connections 189 and 190, depending from the drums and connected with the sections of the chutes, the flexible connections 185 extending longitudinally of the chutes and connected with the lower sections thereof, and a series of drums connected with the said flexible connections 185, 189 and 190, substantially as described.

79. In an apparatus for handling material in bulk, the combination with a bin having a dumping-gate, and a conveyer arranged beneath the dumping-gate, of a pair of rams connected with the dumping-gate, a compensating valve connecting the rams, and means for connecting the compensating valve with the dumping-gate, whereby the said valve will be automatically controlled to vary the power of the rams, substantially as described.

80. In an apparatus for handling material in bulk, the combination with a movable dumping-gate, of rams connected with the dumping-gate, a compensating valve connected with the rams, connections between the compensating valve and the dumping-gate for operating the former automatically, and means for operating the equalizing-valve by hand, substantially as described.

81. In an apparatus for handling material in bulk, the combination of a barge having a series of bins or compartments provided with centrally-arranged cut-offs and having dumping-gates located at opposite sides of the cut-offs, rams located at opposite sides of the cut-offs and arranged in pairs and having their plungers connected with the dumping-gates, compensating valves located between the rams of each pair and connecting the same, connections between the compensating valves and the dumping-gates for operating the former automatically, and operating mechanism for enabling the valves to be operated by hand independently of one another, substantially as described.

82. In an apparatus for handling material in bulk, the combination of a barge, a tower, an endless conveyer extending from the barge to the tower and having upright flights at the front and back of the same and provided in rear of the tower with an intermediate horizontal flight, and a safety-stop located above the intermediate horizontal flight and normally held out of contact with the same, substantially as described.

83. In an apparatus for handling material in bulk, the combination of a barge, a tower, an endless conveyer extending from the barge to the tower, and a safety-stop normally held out of contact with the conveyer and arranged to lock the same against backward movement, substantially as described.

84. In an apparatus for handling material in bulk, the combination of a barge, a tower mounted on the barge and having an opening, a conveyer having flights at the front and back of the tower and extending to the top thereof, booms arranged at opposite sides of the tower, a chute supported by the tower and arranged to swing through the opening thereof to arrange it at either side of the barge, and means for connecting it with either boom, substantially as described.

85. In an apparatus for handling material in bulk, the combination of a barge, a tower mounted on the barge and having an opening, a conveyer extending to the top of the barge and having flights arranged at the front and back of the same, a chute depending from the top of the tower and arranged to swing through the same and through the conveyer, flexible connections arranged at opposite sides of the tower and provided with means for engaging the chute, and a winch arranged adjacent to the opening of the tower and provided with drums adapted to receive the said flexible connections, substantially as described.

86. In an apparatus for handling material in bulk, the combination of a barge, a tower, a conveyer extending from the barge to the tower, a superimposed chute supported by the tower and arranged to swing to either side of the barge, flexible connections arranged at opposite sides of the tower and adapted to be connected with the chute to support the same at either side of the barge, and a winch having drums adapted to receive the flexible connections at either side of the tower, substantially as described.

87. In an apparatus for handling material in bulk, the combination of a barge, a tower having an opening, a conveyer extending from the barge to the tower, a chute depending from the top of the tower and arranged to swing through the opening, a winch mounted within the opening of the tower, and means for connecting the winch with the chute when the latter is at either side of the barge, substantially as described.

88. In an apparatus for handling material in bulk, the combination of a barge, a tower having an opening, a conveyer arranged to carry material from the barge to the tower, a superimposed chute arranged to swing through the opening of the tower, a winch mounted within the opening of the tower, and the flexible connections arranged at opposite sides of the tower and adapted to be connected with the chute and the winch for supporting the former at either side of the tower, substantially as described.

89. The combination of a barge, a tower having an opening, a conveyer, booms located at opposite sides of the tower, a superimposed chute supported by the tower and ar-

ranged to swing through the same and composed of sections, a winch mounted within the opening of the tower, and the two sets of flexible connections located at opposite sides of the tower and connected with the booms, either set being adapted to be connected to the chute and to the winch, substantially as described.

90. In an apparatus for handling material in bulk, the combination of a barge, a tower having an opening, a conveyer, the horizontally-swinging booms arranged at opposite sides of the tower, the superimposed chutes supported by the tower and arranged to swing through the opening thereof and composed of sections, a winch mounted within the opening of the tower and provided with a series of drums, and the two sets of flexible connections located at opposite sides of the tower and connected with the booms and provided with means for detachably engaging the chutes and the drums whereby either set may be used, substantially as described.

91. In an apparatus for handling material in bulk, the combination of a tower having an opening, a chute depending from the top of the tower and arranged to swing through the opening, flexible connections located at opposite sides of the tower, either set being adapted to be attached to the chute, and a winch located in the opening of the tower and adapted to receive either set of flexible connections, substantially as described.

92. In an apparatus for handling material in bulk, the combination of a tower having an opening, a chute depending from the top of the tower and arranged to swing through the opening, booms mounted on the tower at opposite sides thereof, flexible connections mounted on the booms and adapted to engage the chute, either set of flexible connections being adapted to be connected with the chute to support the same in position for use, and a winch mounted in the opening of the tower and adapted to receive either set of flexible connections, substantially as described.

93. In an apparatus for handling material in bulk, the combination of a tower having an opening, a superimposed chute depending from the top of the tower and mounted within the opening thereof and having a pivotal and rotary movement whereby it is adapted to swing both longitudinally and transversely to arrange it at any desired position at either side of the tower, and booms hinged to the tower above the openings thereof and arranged to swing horizontally and provided with means for supporting the chute, substantially as described.

94. In an apparatus for handling material in bulk, the combination of a barge provided with a series of bins or compartments, a tower, a superimposed chute suspended from the tower, a conveyer extending from the barge to the tower and having a horizontal flight located beneath the bins or compartments, and a series of trimmers arranged between the horizontal flight and the bins or compartments, substantially as described.

95. In an apparatus for handling material in bulk, the combination of a barge provided with a series of bins or compartments, a conveyer having a flight extending beneath the bins or compartments, and a series of trimmers interposed between the bins or compartments and the conveyer, substantially as described.

96. In an apparatus for handling material in bulk, the combination of a barge having a series of bins or compartments, a tower arranged at the front of the barge, an endless conveyer composed of a horizontal flight arranged beneath the bins or compartments, upright flights arranged at the front and back of the tower, and an intermediate horizontal flight located above the barge in rear of the tower, a series of trimmers interposed between the bins or compartments and the lower horizontal flight, a superimposed chute, and a safety-stop located above the intermediate horizontal flight and normally held out of contact with the same, substantially as described.

97. In an apparatus for handling material in bulk, the combination of a barge having a series of bins or compartments, a tower arranged at the front of the barge, an endless conveyer having pivoted buckets and composed of a horizontal flight arranged at the bottom of the barge beneath the bins or compartments, the upright flights arranged at the front and back of the tower, and the intermediate horizontal flight extending rearward from the tower, a series of trimmers interposed between the bins or compartments and the bottom horizontal flight of the conveyer, and a reversing-cam arranged at the back of the intermediate horizontal flight for changing the position of the buckets as they enter the barge, substantially as described.

98. In an apparatus for handling material in bulk, the combination of a barge having bins or compartments, a tower, a superimposed chute suspended from the tower, a conveyer having pivoted buckets and extending from the barge to the tower, dumping mechanism located at the top of the tower over the chute, and a reversing-cam arranged at the back of the barge to change the position of the buckets as they enter the latter, substantially as described.

99. In an apparatus for handling material in bulk, the combination of a barge, a tower having an opening, an endless conveyer having pivoted buckets and extending from the barge to the tower and having upright flights arranged at the front and back of the tower, and provided with an approximately horizontal flight located at the top of the tower, the buckets of the horizontal flight being normally in an upright position, a superimposed chute suspended from the top of the tower at a point beneath the conveyer and arranged to swing through the opening of the tower, and dumping mechanism arranged at the top

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of the tower over the chute, substantially as described.

100. In an apparatus for handling material in bulk, the combination of a barge, a tower having an opening, an endless conveyer provided with pivoted buckets and composed of a bottom horizontal flight located within the barge, upright flights arranged at the front and back of the tower, and an intermediate flight extending from the tower to the stern of the barge, a chute suspended from the top of the tower and arranged to swing through the opening, dumping mechanism arranged at the top of the tower over the chute, and means located at the back of the intermediate flight for reversing the buckets as they enter the barge, substantially as described.

101. In an apparatus for handling material in bulk, the combination of a barge having a series of bins or compartments, a tower having an opening, an endless conveyer provided with pivoted buckets and composed of a bottom horizontal flight located within the barge beneath the bins or compartments, upright flights arranged at the front and back of the tower, and an intermediate horizontal flight extending rearward from the tower, a chute suspended from the tower and arranged to swing through the opening, dumping mechanism arranged at the top of the tower over the chute, a reversing-cam arranged at the rear portion of the intermediate flight for changing the position of the buckets as they enter the barge, and a series of trimmers interposed between the horizontal flight and the bins or compartments, substantially as described.

102. In an apparatus for handling material in bulk, the combination of a barge having a series of bins or compartments provided with dumping-gates, a tower, a superimposed chute, a conveyer extending from the barge to the tower, hydraulic rams connected with the dumping-gates, and means automatically operated by the dumping-gates for varying the power of the rams, substantially as described.

103. In an apparatus for handling material in bulk, the combination of a barge having a series of bins or compartments, a tower having an opening, a chute arranged at the opening, an endless conveyer having pivoted buckets and extending from the barge to the tower and passing over the chute, dumping mechanism arranged at the top of the tower over the chute, a series of trimmers arranged at the bottom of the bins or compartments, and means for successively discharging the contents of the bins or compartments into the conveyer, substantially as described.

104. In an apparatus for handling material in bulk, the combination of a barge having a longitudinal series of bins or compartments, a tower having an opening, a superimposed chute located at the opening, an endless conveyer having pivoted buckets and extending beneath the bins or compartments and over the chute, dumping mechanism arranged at the top of the tower over the chute, reversing mechanism arranged in rear of the dumping mechanism, a series of trimmers interposed between the bins or compartments and the conveyer, and a safety-stop arranged normally out of contact with the conveyer, substantially as described.

105. In an apparatus for handling material in bulk, the combination of a barge having a longitudinal series of bins or compartments provided with cut-offs, a tower, a chute suspended from the tower, a conveyer extending from the barge to the tower, dumping-gates arranged at opposite sides of the bins or compartments, hydraulic rams arranged in sets at opposite sides of the barge and connected with the dumping-gates, compensating valves connected with the rams of each set for varying the power of the same, means for operating the rams from the deck of the barge, and connections between the dumping-gates and the compensating valves, whereby the latter will be automatically controlled, substantially as described.

106. In an apparatus for handling material in bulk, the combination of a barge having a series of bins or compartments provided with cut-offs, a tower having an opening, an endless conveyer having pivoted buckets extending beneath the bins or compartments and from the barge to the tower, a chute suspended from the top of the tower at the opening thereof, dumping mechanism arranged at the top of the tower, a winch located in the opening of the tower and connected with the chute, means for operating the cut-offs from the deck of the barge, whereby the bins or compartments are successively opened, and trimmers located adjacent to the cut-offs, substantially as described.

107. In an apparatus for handling material in bulk, the combination of a barge, a tower, a superimposed chute supported by the tower, an endless conveyer extending from the barge to the chute, a series of trimmers arranged in the barge, dumping mechanism located at the top of the tower for emptying the contents of the conveyer into the chute, reversing mechanism located in rear of the tower, and a safety-stop, substantially as described.

108. In an apparatus for handling material in bulk, the combination of a barge, a tower, a superimposed chute supported by the tower, an endless conveyer extending from the barge to the tower and provided with pivoted buckets, dumping mechanism arranged at the top of the tower, reversing mechanism located in rear of the dumping mechanism, for raising the buckets in proper position for entering the barge, and means for holding the buckets in such position, substantially as described.

109. In an apparatus for handling material in bulk, the combination of a barge having a series of bins or compartments provided with independently-operable cut-offs, a tower, a superimposed chute supported by the tower,

a conveyer having pivoted buckets and extending from the barge to the tower, dumping mechanism located at the top of the tower, reversing mechanism for changing the position of the buckets to arrange them properly for entering the barge, and trimmers located within the barge, substantially as described.

110. In an apparatus for handling material in bulk, the combination of a barge having a series of bins or compartments, a tower, a superimposed chute, an endless conveyer having pivoted buckets and extending from the barge to the chute, dumping mechanism arranged at the top of the tower, reversing mechanism arranged in rear of the dumping mechanism, and means for successively discharging the contents of the bins or compartments in the conveyer, substantially as described.

111. In an apparatus for handling material in bulk, the combination of a barge provided with a series of bins or compartments and having cut-offs, a conveyer having a flight extending beneath the bins or compartments, a series of trimmers interposed between the bins or compartments and the conveyers, and operating mechanism extending from the deck of the barge to the cut-offs for operating the latter independently of one another, substantially as described.

112. In an apparatus for handling material in bulk, the combination of a barge, a tower, a superimposed chute, a conveyer having pivoted buckets and extending from the barge to the tower, dumping mechanism located at the top of the tower over the chute, a reversing-cam arranged at the back of the barge to change the position of the buckets as they enter the latter, and means for holding the buckets in such position until they enter the barge, substantially as described.

113. In an apparatus for handling material in bulk, the combination of a barge, a tower, a superimposed chute suspended from the tower, booms arranged at opposite sides of the tower, adjustable connections also located at opposite sides of the tower and depending from the booms and provided with means for detachably engaging the chute, and a winch adapted to be connected with either set of adjustable connections, substantially as described.

114. In an apparatus for handling material in bulk, the combination of a barge, a tower, a superimposed chute suspended from the tower, booms arranged at opposite sides thereof, adjustable connections located at opposite sides of the tower, and depending from the booms and provided with means for engaging the chute, a winch arranged to receive either set of adjustable connections, a conveyer provided with pivoted buckets and extending from the barge to the chute, dumping mechanism arranged at the top of the tower over the chute, and a reversing-cam for changing the position of the buckets as they enter the barge, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

PEETE B. CLARKE.

Witnesses:
JOHN FRENCH,
CHARLES ENGEL.

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426-427

No. 718,092. PATENTED JAN. 13, 1903.

P. B. CLARKE.

SWIVEL CHUTE HEAD.

APPLICATION FILED JAN. 30, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

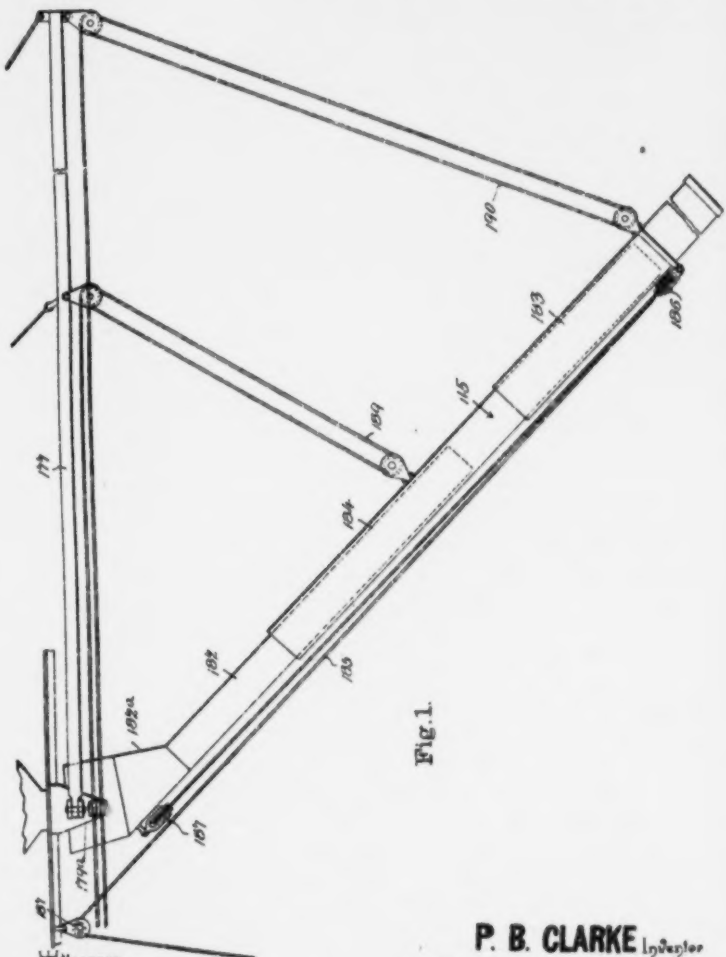


Fig. 1.

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428–429

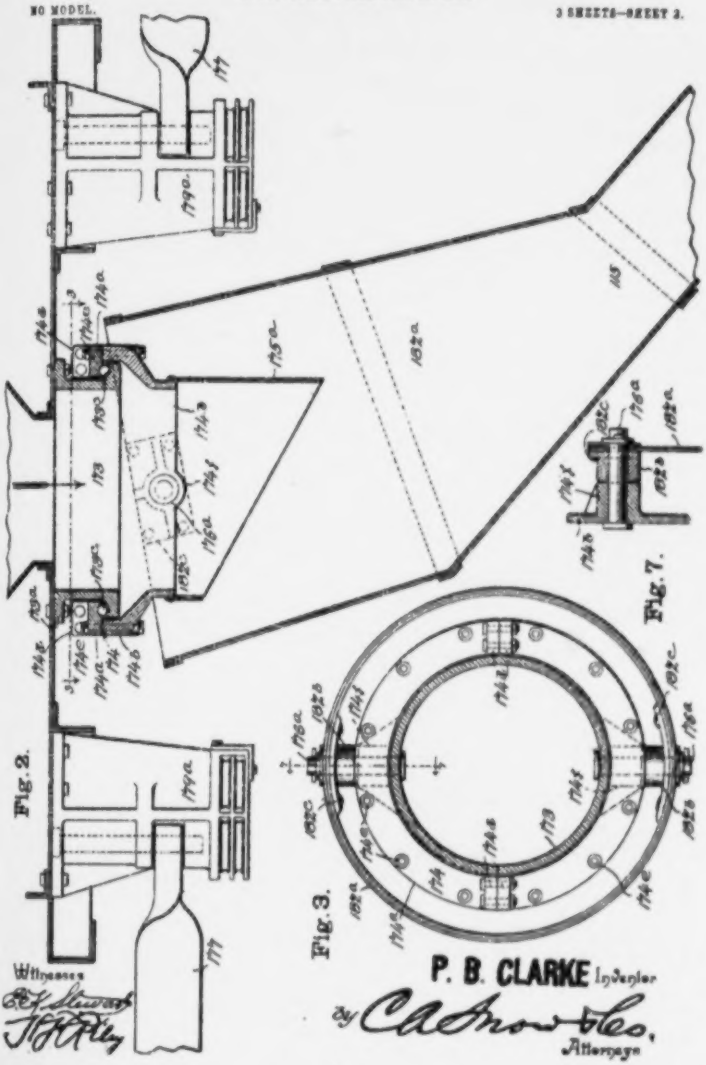
No. 718,092. PATENTED JAN. 13, 1903.

P. B. CLARKE.

SWIVEL CHUTE HEAD.

APPLICATION FILED JAN. 30, 1901.

NO MODEL. 3 SHEETS—SHEET 3.



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No. 718,092. PATENTED JAN. 13, 1903.

P. B. CLARKE.

SWIVEL CHUTE HEAD.

APPLICATION FILED JAN. 30, 1901.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 4.

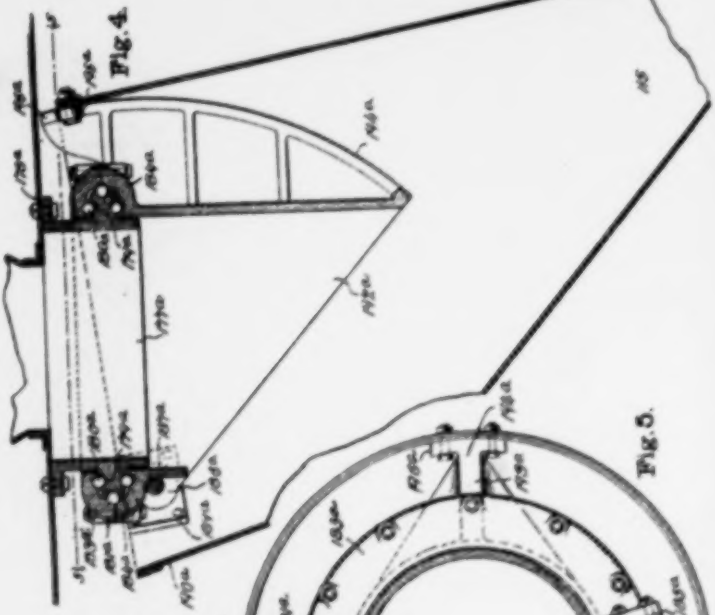


Fig. 5.

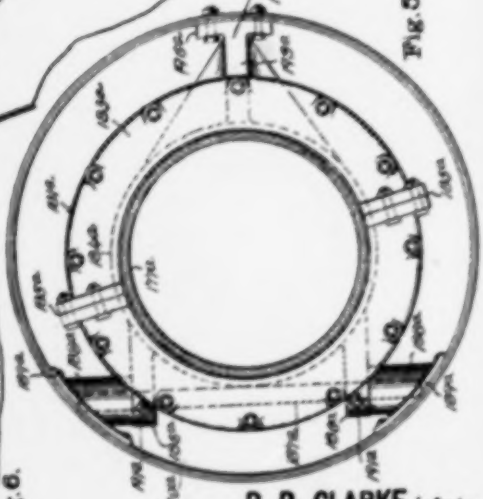
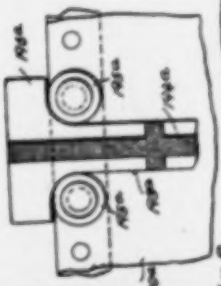


Fig. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

PEETE B. CLARKE, OF NEW YORK, N. Y.

SWIVEL CHUTE-HEAD.

SPECIFICATION forming part of Letters Patent No. 718,092, dated January 13, 1903.

Application filed January 28, 1901. Serial No. 44,783. (No model.)

To all whom it may concern:

Be it known that I, PEETE B. CLARKE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a new and useful Swivel Chute-Head, of which the following is a specification.

The invention relates to a swivel chute-head for apparatus for handling material in bulk.

The object of the present invention is to provide for apparatus for handling material in bulk a swivel chute-head adapted to permit a superimposed chute to be swung upward and downward and capable of enabling the same to be rotated or swung horizontally, whereby the chute may be readily arranged in proper position for discharging the material.

A further object of the invention is to permit such adjustments of a chute without allowing any of the material to escape at the chute-head or joint between the chute and its support.

The invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended.

In the drawings, Figure 1 is a side elevation of a chute having a swivel chute-head constructed in accordance with this invention. Fig. 2 is an enlarged vertical sectional view of the upper end or head of the chute. Fig. 3 is a horizontal sectional view on the line 3 3 of Fig. 2. Fig. 4 is a vertical sectional view, similar to Fig. 2, illustrating another form of the invention. Fig. 5 is a horizontal sectional view on line 5 5 of Fig. 4. Fig. 6 is a detail view illustrating the arrangement of the antifriction-rollers with relation to the curved guide. Fig. 7 is a detail sectional view on line 7 7 of Fig. 3.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

115 designates a depending extensible chute adapted to swing vertically and horizontally and preferably composed of upper, lower, and intermediate sections 182, 183, and 184, which are adapted to slide or telescope to vary the length of the chute. The upper section 182 of the chute is provided with an enlarged end or top 182^a, tapering downwardly and pivotally connected by the means hereinafter described with a rotary bearing-sleeve 174, which is mounted on a supporting-neck 173. The annular supporting-neck 173 is provided with an upper attachment-flange 173^a and it has a lower bearing-flange 173^b, and the upper flange 173^a is perforated for the reception of bolts or other suitable fastening devices for securing the neck 173 to the support for the chute. The lower bearing-flange 173^b extends outward from the exterior of the neck 173 and is provided at its upper face with an annular groove forming a race for antifriction-balls 173^c, which enable the bearing-sleeve 174 to rotate frictionlessly on the supporting-neck 173. The bearing-sleeve 174 is composed of upper and lower rings 174^a and 174^b, and the ring 174^a is also composed of semicircular sections provided at their ends with abutting flanges 174^d, which are bolted or otherwise secured together, as clearly illustrated in Fig. 3 of the accompanying drawings. The upper bearing-ring 174^a is arranged above the bearing-flange 173^b of the supporting-neck 173, and it rests upon the antifriction-balls and extends outward beyond the same. The projecting portion of the upper bearing-ring 174^a is secured to the lower ring 174^b by an annular series of bolts 174^e or other suitable fastening devices arranged as clearly illustrated in Fig. 3. The lower ring 174^b has a contracted lower portion and is provided with a depending inner chute-section 175^a, extending downward into the enlarged upper end of the upper chute-section 182 and adapted to prevent the escape of material when the said chute-section 182 is in any position. The inner chute-section, which is tapering and which is disposed vertically, may be constructed separate from the lower ring, as illustrated in Fig. 2 of the accompanying drawings, or it may be formed integral, as hereinafter explained in connection with Fig. 4, and it is adapted to permit the chute 115 to swing on its pivot in either direction as far as possible without any liability of the material escaping through the chute head or connection. The lower ring is provided at opposite sides with tubular extensions 174^f, adapted to register with corresponding tubular extensions 182^b of the upper section 182 of the chute, and

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these tubular extensions form eyes for the reception of pivots or pintles 176ᵃ, on which the chute 115 swings. The eyes or tubular extensions of the ring are preferably formed integral therewith, and the eyes or bearings 182ᵃ are preferably formed integral with plates 182ᵇ, which are riveted or otherwise secured to the enlarged upper end of the upper section 182 of the chute. The pivots, which are provided at their inner ends with heads, have suitable fastening devices at their outer ends for retaining them in alined eyes of the lower ring and the upper chute-section 182. By this construction the chute is pivoted to the bearing-sleeve at opposite sides thereof and the said bearing-sleeve is adapted to rotate on the supporting-neck. These movements will permit the chute to swing vertically and horizontally, whereby it may be arranged in the proper position for discharging the material handled.

In Figs. 4 to 6, inclusive, of the accompanying drawings is illustrated another form or modification of the invention in which a depending neck 177ᵃ is employed, and this depending neck is provided with an upper attachment-flange 178ᵃ, and it has a lower bearing-flange 179ᵃ, located between the upper and lower edges of the neck and provided at its upper, lower, and side faces with annular grooves forming ball-races for antifriction-balls 180ᵃ interposed between the bearing-flange and a bearing-sleeve 181ᵃ. The bearing-sleeve 181ᵃ is composed of upper and lower bearing-rings 183ᵃ and 184ᵃ, and the upper bearing-ring is sectional and is provided at the ends of its sections 185ᵃ with abutting flanges which are bolted or otherwise secured together, as clearly illustrated in Fig. 5 of the drawings. By constructing the upper bearing-ring of sections the bearing-sleeve is readily interlocked with the bearing-flange of the depending neck and the parts may be readily assembled. The lower bearing-ring of the bearing-sleeve is provided with a pair of rearwardly-extending eyes 186ᵃ, located at opposite sides of the bearing-sleeve and receiving a continuous pivot or pintle 187ᵃ, which extends beyond the eyes 186ᵃ into a pair of eyes 188ᵃ, formed integral with plates 189ᵃ, which are secured to an upper chute-section 190ᵃ, as clearly shown in Fig. 5. The bores of the eyes 188ᵃ of the upper chute-section are arranged opposite apertures or openings of the latter, and the pivot or pintle is retained in place by set-screws 191ᵃ, mounted in threaded perforations of the rearwardly-extending ears and engaging the pivot or pintle. The bearing-sleeve is provided with an inner tapering chute-section 192ᵃ, depending from and formed integral with the lower bearing-ring and provided at its front side with a curved guide 193ᵃ, consisting of a skeleton frame having a curved outer edge struck on an arc of which the pivot 187ᵃ is the center. The guide is provided at opposite sides with laterally-extending webs or flanges 194ᵃ, located between a pair of antifriction rollers or wheels 195ᵃ and provided at its top with a head 196ᵃ, forming laterally-extending stops arranged to be engaged by the antifriction rollers or wheels, as clearly illustrated in Fig. 6 of the accompanying drawings, when the upper section of the chute is at the limit of its movement in one direction and the guide is provided at its bottom with a suitable stop for limiting the movement of the chute in the opposite direction. The antifriction rollers or wheels 195ᵃ are mounted on the inner face of the upper section 190ᵃ of the chute and are located at the upper edge of the same, and they permit the chute to move freely and frictionlessly. The guide supports the chute and prevents the same from moving laterally and straining the pivot.

The chute is controlled by suitable ropes or cables designed to be operated by a winch (not shown) and connected with a boom 177, which is hinged at its inner end. A pair of booms are designed to be provided and are located at opposite sides of the upper end of the chute, as indicated in Fig. 2 of the accompanying drawings, suitable brackets 197ᵃ being provided for supporting the booms. The telescoping or sliding movement of the sections is controlled by a rope or cable 185, secured at one end to the upper section of the chute and extending longitudinally of the latter to a pulley 186 and passing therefrom rearwardly along the chute to a pulley 187. The pulley 186 is mounted on the lower section of the chute, and it will be apparent that by drawing in the cable or line 185 and by paying the same out the chute may be shortened or lengthened. The intermediate and lower sections of the chute are connected with the boom by means of ropes or cables 189 and 190. The rope or cable 189 is secured at one end to the boom at a point intermediate of the ends thereof, and it extends downward to the intermediate section and back to the boom, forming a supporting-loop, which is connected with the intermediate section 184 by a suitable block having a pulley. The other rope or cable 190 is arranged at the outer end of the boom and is connected in a similar manner with the lower or bottom section 183, and by drawing in the ropes or lines 189 and 190 and paying them out it will be clear that the chute may be swung upward and downward to arrange it at the desired elevation.

It will be apparent that the construction for supporting the depending chute is simple and comparatively inexpensive in construction, that it will permit the chute to be swung vertically and horizontally to arrange the same in the desired position, and that it will prevent the material from escaping at the top of the chute when the latter is in any position.

What I claim is—

1. A device of the class described comprising a support forming a conduit for the ma-

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terial, a movable chute suspended from the support, and an inner chute-section mounted independently of the chute and located wholly within the latter, substantially as described.

2. A device of the class described comprising a support, a chute, and an inner chute-section mounted independently of the chute and located wholly within the same, substantially as described.

3. A device of the class described comprising a rotary bearing-ring, a chute pivotally connected with the bearing-ring, an inner chute-section mounted independently of the said chute, and means for supporting the bearing-ring, substantially as described.

4. A device of the class described comprising a support, a rotary bearing-ring, a chute pivotally connected to and carried by the rotary bearing-ring, and a tapering inner chute-section, extending downward below the bearing-ring and mounted independently of the said chute, substantially as described.

5. A device of the class described comprising a supporting-neck having a bearing-flange, a bearing-sleeve interlocked with the neck and composed of upper and lower bearing-rings, the upper bearing-ring consisting of sections, and a chute pivotally suspended from the bearing-sleeve, substantially as described.

6. A device of the class described comprising a supporting-neck having a bearing-flange provided with upper, lower and outer ball-races, antifriction-balls arranged in the races, a rotary bearing-sleeve interlocked with the supporting-neck and receiving the bearing-flange and the said balls and composed of a sectional upper ring, and a lower ring secured to the upper ring, and a chute pivotally connected with the bearing-sleeve, substantially as described.

7. A device of the class described comprising a rotary bearing-sleeve provided with a curved guide, a chute pivotally connected with the bearing-sleeve and supported by the guide, and a supporting-neck receiving the bearing-sleeve, substantially as described.

8. A device of the class described comprising a support, a rotary bearing-sleeve, a chute pivotally connected with the rotary bearing-sleeve and carried by the same, and an upright guide having a curved outer face arranged to support the chute, substantially as described.

9. A device of the class described comprising a support, a rotary bearing-sleeve, a chute pivotally connected with the bearing-sleeve and carried by the same, a curved guide depending from the bearing-sleeve, and antifriction-wheels mounted on the chute and arranged to run on the guide, substantially as described.

10. A device of the class described comprising a support, a rotary bearing-sleeve, a chute pivotally connected with the bearing-sleeve at opposite sides of the back thereof, and a curved guide extending downward from the front of the bearing-sleeve and supporting the chute, substantially as described.

11. A device of the class described comprising a support, a rotary bearing-sleeve, a chute pivotally connected with the bearing-sleeve, a guide extending downward from the bearing-sleeve and provided at its ends with stops, and a pair of antifriction-wheels mounted on the chute and arranged at opposite sides of the guide, substantially as described.

12. A device of the class described comprising a support, a rotary bearing-ring, a chute pivotally connected with the bearing-ring, an inner chute-section extending downward from the bearing-ring, and a curved guide mounted on the bearing-ring and on the inner chute-section and supporting the chute, substantially as described.

13. A device of the class described comprising a rotary sleeve, and a chute pivotally connected with and supported by the sleeve, whereby it is adapted to be swung vertically and horizontally, and means for supporting the sleeve, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

PEETE B. CLARKE.

Witnesses:
JOHN FRENCH,
CHARLES ENGEL.

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436

No. 721,215. PATENTED FEB. 24, 1903.

C. METZGER.

SUPPORT FOR CONVEYERS.

APPLICATION FILED SEPT. 30, 1902.

NO MODEL.

FIG. 1.

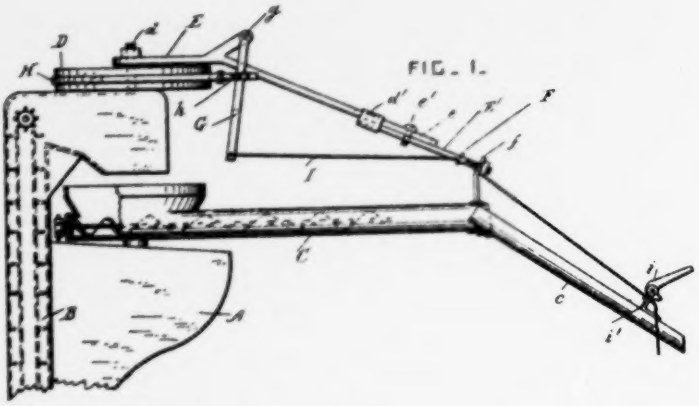


FIG. 2.

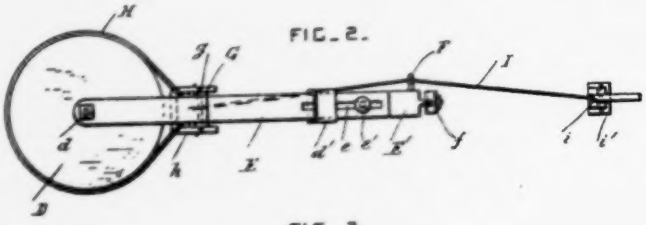
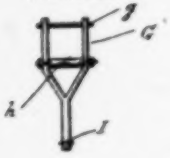


FIG. 3.



WITNESSES

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R. H. Young

INVENTOR

Charles Metzger

by Robert N. Jones

Attorney

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UNITED STATES PATENT OFFICE.

CHARLES METZGER, OF WHITTEMORE, IOWA.

SUPPORT FOR CONVEYERS.

SPECIFICATION forming part of Letters Patent No. 721,215, dated February 24, 1903.

Application filed September 26, 1902. Serial No. 124,977. (No model.)

To all whom it may concern:

Be it known that I, CHARLES METZGER, a citizen of the United States, residing at Whittemore, in the county of Kossuth and State of Iowa, have invented certain new and useful Improvements in Supports for Conveyers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to supports for the conveyers used to deliver the grain from threshing-machines into wagons; and it consists in the novel construction and combination of the parts hereinafter fully described and claimed.

In the drawings, Figure 1 is a side view of the support, showing it in position. Fig. 2 is a plan view of the support. Fig. 3 is a detail view of the forked brake-lever.

A is a portion of the casing of a threshing-machine or grain-separator.

B is a portion of an elevator for raising the grain delivered by the machine.

C is a conveyer which receives the grain from the elevator B and delivers it into wagons. This conveyer is pivoted to the top part of the casing of the threshing-machine, so that it may be swung around to any convenient position, and it is provided with a hinged spout *c*.

All the above-mentioned parts are of any approved construction and do not form a part of the present invention.

The free end portion of the conveyer is usually supported by a cord, and it is usually necessary to tie it to the wagon to prevent it from swinging about and spilling the grain.

According to the present invention special means are provided for preventing the conveyer from swinging around when not desired without securing it to the wagon.

D is a stationary brake disk or wheel which is secured to the top of the elevator or other convenient position.

E is an arm which is pivoted by the pin *d* concentric with the disk D and in line with the pivot of the conveyer. This arm is preferably provided with an extensible section E', which slides against the main portion of the arm and is provided with suitable guides *d'* to keep it in alinement. One of the arm-sections is provided with a slot *e*, and *e'* is a screw for securing the two sections together after their length has been adjusted. The outer section E' is provided with a fastening *f* for securing it to the free end portion of the conveyer.

F is an eye which projects laterally from the free end portion of the section E'.

G is a forked brake-lever the upper end portion of which is pivoted by a pin *g* to the upper part of the arm E.

H is a brake-band which encircles the disk D and which has its ends pivotally connected to the middle part of the lever G by means of a yoke *h*.

I is a cord which is secured at one end to the lower end of the lever G. This cord is passed through the eye F, and its other end portion is connected to the free end portion of the hinged grain-spout *c* by means of a catch *i*. This catch preferably consists of a cam provided with a handle and pivoted in a bracket *i'*, which is secured to the spout. The cord passes between the cam and the bracket and is clamped by the said cam.

The support may be swung around to any position, and the spout may be set to any desired angle. The weight of the spout and the grain in it pulls the cord I and causes the brake-band to be pressed on the brake-disk by means of the forked brake-lever, so that when the machine is at work and grain is being delivered through the spout the conveyer is held stationary in one position and does not have to be tied to the receiving-wagon.

This device can be made and sold as an article of manufacture and can be applied to existing conveyers in place of the usual supporting-cord.

What I claim is—

1. In a support for a conveyer, the combination, with a brake-disk, of an arm pivoted concentric with the disk and provided with a fastening for engaging with the free end of a conveyer, a brake-band, a lever pivoted to the said arm and connected with the brake-band, and a flexible connection secured to the said lever and adapted to be connected with the grain-spout of the conveyer, substantially as set forth.

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2. In a support for a conveyer, the combination, with a brake-disk, of an arm for supporting a conveyer pivoted concentric with the said disk, and automatic brake mechanism supported by the said arm and operating to secure it to the said disk when the conveyer is in operation, substantially as set forth.

3. In a support for a conveyer, the combination, with a brake-disk, of an extensible arm pivoted concentric with the disk and provided with a fastening for engaging with the free end of a conveyer, and automatic brake mechanism supported by the said arm and operating to secure it to the said disk when the conveyer is in operation, substantially as set forth.

4. In a support for a conveyer, the combination, with a brake-disk, of an arm for supporting the conveyer pivoted concentric with the said disk, a brake-band encircling the said disk, a brake-lever pivoted to the said arm and connected with the said band, a flexible connection connected to the said lever and supported by the said arm, and a catch for connecting the said flexible connection with the grain-spout, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES METZGER.

Witnesses:
GEORGE METZGER,
HENRY PRAMLACH.

807

440

No. 753,618. PATENTED MAR. 1, 1904.

T. NICHOLSON.

CONVEYER OR CHUTE FOR INFILLING MATERIAL.

APPLICATION FILED JULY 26, 1902.

NO MODEL.

Fig. 1.

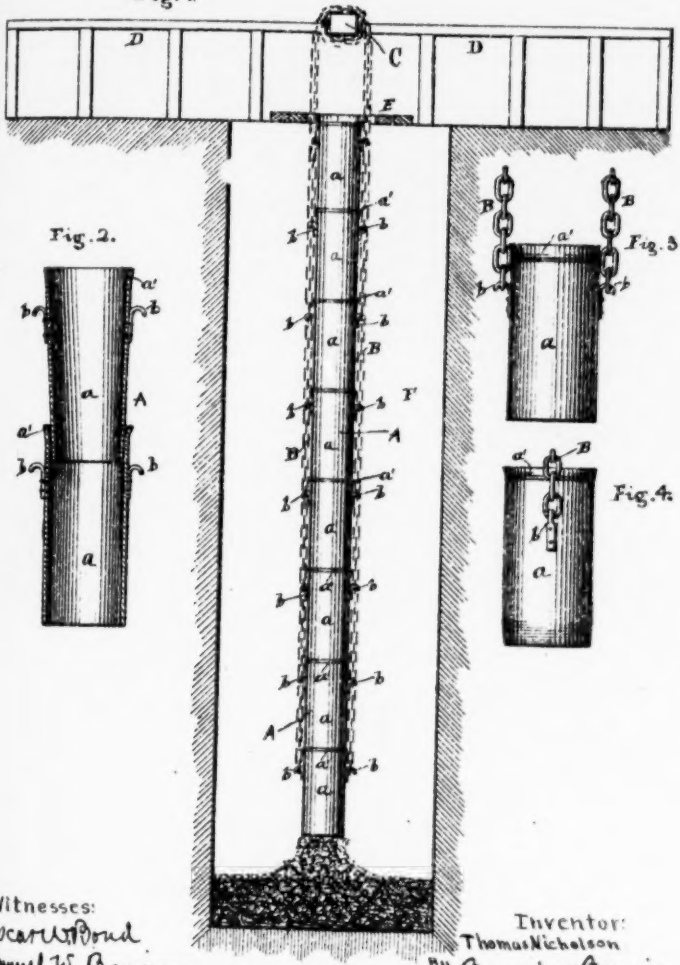


Fig. 2.

Fig. 3.

Fig. 4.

Witnesses:
Oscar W. Bond
Samuel W. Banning.

Inventor:
Thomas Nicholson
By Banning & Banning,
Atty's

808

441

No. 753,616. Patented March 1, 1904.

UNITED STATES PATENT OFFICE.

THOMAS NICHOLSON, OF CHICAGO, ILLINOIS.

CONVEYER OR CHUTE FOR INFILLING MATERIAL.

SPECIFICATION forming part of Letters Patent No. 753,616, dated March 1, 1904.

Application filed July 26, 1902. Serial No. 117,087. (No model.)

To all whom it may concern:

Be it known that I, THOMAS NICHOLSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Conveyers or Chutes for Infilling Material, of which the following is a specification.

This invention relates more especially to means for conveying or delivery concrete, cement, mortar, and other material to the bottom of excavations, pits, and other similar inaccessible places, and has for its object to construct a conduit or tube made up in sections readily detachable one from the other and constituting as a whole a continuous chute or conveyer through which the material will pass to be delivered at the end of the conveyer or chute, to so suspend and support the sectional conduit or tube as to enable the same to be swung as a whole laterally without interfering with its operation as a conveyer or chute, and to improve generally the construction, arrangement, and operation of the conveyer or chute as a whole.

The invention consists in the features of construction and combinations of parts hereinafter described and claimed.

In the drawings, Figure 1 is an elevation showing a hole to be filled with the conveyer or chute of the invention suspended therein and reaching nearly to the bottom thereof; Fig. 2, a sectional elevation showing one manner of interlocking one section of the conduit or tube with another; Fig. 3, an elevation of a single section of the conduit or tube, showing a manner of attachment to the suspending-chain; and Fig. 4, an elevation of a single section of the conduit or tube, likewise showing the attachment to the suspending-chain.

The conveyer A is formed of a sectional conduit or tube, each section *a* having a flaring end *a'*, into which is entered the end of the preceding section, so as to form a species of lap-joint or interlock of one section with another, the lap-joint or interlock furnishing a sufficiently-rigid connection between the sections to enable the conduit or tube as a whole to be swung laterally without breaking or disrupting the conveyer or chute, and it is preferred to have the lap or interlock on the inside, so as to present a smooth face for the downward passage of the material through the conveyer or chute. The sections can be made of sheet-iron or other sheet metal or light material of sufficient strength to withstand the wear and strain in use, and the sections can have a diameter of eight or ten inches and a length of four or five feet or such other diameter and length as may be desired, it being understood that the diameter and length should be such as to furnish a clear passage for the material through the conveyer or tube and to enable the lower section as the filling progresses upward to be readily detached and removed, so that the next preceding section will form the delivery end of the conveyer or chute. Each section of the conduit or tube in the arrangement shown has on opposite sides hooks or lugs *b* of a form to be readily entered into the links of the suspending-chains B, one chain being provided for each side of the conveyer or chute. Each chain is lapped around or otherwise attached in the arrangement shown to a supporting-beam C on a platform or framework D, but could be otherwise attached to the beam, or the chains could be tied or connected to any suitable support at the upper end so long as the connection and the manner of suspending the chain is one that will hold the sections of the conduit or tube entered one into the other and interlocked, so that the conveyer or chute can be swung laterally as may be required to deliver and distribute the material within the hole or excavation to be filled. The upper end of the conduit or tube terminates at the top of the excavation or hole to be filled, and in the arrangement shown a planking or covering E is placed over the mouth of the hole or excavation, with a suitable opening therein for the end of the conveyer or chute and the passage of the suspending chains.

In use the conveyer or chute A, of a length to suit the depth of the excavation or hole F which is to be filled, is made up or constructed by attaching the lowermost section of the conduit or tube by its ears *b* to a link of the

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chain on each side. The next preceding section is entered at its lower end into the upper end *a* of the first section, and the second section is attached to the chains by its hooks *b*, and the third section is entered at its lower end into the upper end of the second section and its hooks *b* caught into a link of the chain on each side, and section after section is added until the conduit reaches the proper distance above the bottom of the hole or excavation to be filled for the material to discharge from the lower section with sufficient space to be spread and compacted or otherwise manipulated in the excavation or hole, as shown in Fig. 1, where the material is shown as discharging from the conveyer or chute. When the filling has nearly reached the lower end of the first section of the conduit or tube, such first section is unhooked from the suspending chains, and the second section then becomes the discharging-section, and when the filling has nearly reached the height of the lower end of this second section such section is unhooked and the third section becomes the discharging-section, and so on until the upper section is reached, and as each section is unhooked it is to be removed from the hole or excavation by means of a rope (not shown) or otherwise, and the unused ends of the chains can be attached to a cord or cords (not shown) by which can be raised the chains, so as to be kept clear of the filling as the material is discharged into the excavation or hole. The concrete, cement, mortar, or other material to be filled into the excavation or hole is to be mixed in any usual and well-known manner at the top of the ground and from the place of mixing is to be carried or deposited on the platform E, from which it can be easily shoveled or otherwise deposited into the top of the conveyer or chute to pass down therein. The suspending of the conveyer or chute from above by means of chains or other flexible means, so as to hold the sections engaged one with the other, enables the operator or workman at the bottom of the excavation, hole, or pit by taking hold of the lower end of the conduit or tube to swing the discharge end sidewise or laterally in any direction required for directing the material to any desired point and so as to evenly and uniformly distribute the material as it falls from the conveyer or chute.

It will be seen that with my invention a conveyer or chute is provided made up of a sectional conduit, tube, or pipe, each section of which is adapted to be independently supported by a suspending chain or other suspending means, so that one section can be readily detached when necessary, or a section can be added when desired without the requirement of any special skill in detaching or attaching a section and without any waste of time in so doing; that the conduit or tube, while made up of sections, has the sections engaging one with the other by an overlapped joint or interlock, forming, in effect, a continuous conduit or tube or pipe with sufficient rigidity to allow the conveyer or chute as a whole to be swung without breaking or destroying the continuity or interfering with the free passage downward and discharge of the material at the lower end; that as the material rises in the excavation, hole, or pit to be filled the lowermost section of the conduit, tube, or pipe can be detached, leaving a complete conveyer or chute for continuing the filling operation, and the removed or detached section can be withdrawn, leaving the filling space for the reception of the material, that the removable or detachable sections enable the conveyer or chute to be lengthened or shortened at any time without any trouble or inconvenience, it only being necessary for shortening to detach a section and for lengthening to attach a section of the conduit or tube, and that the material can be deposited at the bottom of the excavation, hole, or pit, and its discharge be directed to any point desired through the rigidity of the conveyer or chute, by which the discharge end thereof can be swung to any point desired, so as to deposit the material in a uniform and even manner.

While the suspending means shown are chains, one on each side, it is to be understood that other suitable means, such as looped or knotted cables, wire, or rope may be employed for suspending the sections, each independently, and have the suspension to form a continuous conduit or tube.

The sections of the conduit or tube can be of the same diameter throughout their length except the flare at the receiving end of each section for entering the end of the preceding section and with light material for constructing the sections. The flare will enable the entering end of the section to be forced into the receiving end of the section, the metal or material contracting sufficiently for this purpose, or the entering end could be slightly contracted to facilitate the entering, if so desired, and instead of each section having a body of the same diameter its entire length the body of each section could be made slightly tapering, as shown for the upper section in Fig. 2, which would not interfere with the passage of the material through the conduit or tube.

It will be understood that instead of removing successively each lower section to foreshorten the conduit or tube as the excavation, hole, or pit is filled the conduit or tube could be bodily raised and the upper sections successively removed, thus attaining the same result of a clear space at the lower or discharge end of the conveyer or chute.

The essential and important feature of the present invention is the construction of a conveyer or chute for depositing infilling material from or by means of a sectional conduit,

tube, or pipe the sections of which fit into each other snugly and tightly, giving a support at the joints and combining with such sectional conduit, tube, or pipe flexible suspending means which enable the conveyer or chute to be easily and readily swung at its lower end into discharging position as required, and while the invention has been described as to the construction of the conveyer or chute for infilling material somewhat minutely as to the details and arrangements of the various parts I do not intend thereby to limit myself to specific parts, details, or arrangement further than as the same are specified and called for in the claims, as it is the intention to make such changes in the several parts and elements as circumstances may render desirable or the work to be done may require without departing from the essential plan and features of the invention.

What I regard as new, and desire to secure by Letters Patent, is—

1. In a conveyer or chute for infilling material, the combination of a sectional conduit or tube having its sections detachably connected together and when connected having the entering ends of the sections interlocked one with the other, means for suspending the conduit or tube to hang free, and means for connecting each section independently and detachably to the suspending means, substantially as described.

2. In a conveyer or chute for infilling material, the combination of a sectional conduit or tube having its sections detachably connected together and when connected having close rigid joints at the entering ends of the sections, means for suspending the conduit or tube to hang free, and means for connecting each section independently and detachably to the suspending means, substantially as described.

3. In a conveyer or chute for infilling material, the combination of a conduit or tube consisting of a series of hollow cylindrical sections telescoped partially into each other at their adjacent ends and having rigid close joints at each of said telescopic connections, and means for suspending the conduit or tube and having the sections thereof independently and detachably connected thereto, whereby the conveyer or chute as a whole may be swung about at its lower end without pivotal or telescopic action at the joints and may be extended or shortened by the addition or removal of a section or sections, substantially as described.

4. In a conveyer or chute for infilling material, the combination of a conduit or tube consisting of a series of attachable and detachable hollow cylindrical sections having the same diameter and tapered to telescope partially into each other at their adjoining ends forming rigid joints when the sections are attached, means for suspending the conduit or tube to hang free, means for independently and detachably connecting the sections of the conduit or tube onto the suspending means, and a receiver for and from which the material can be introduced into the upper end of the conduit or tube to be discharged at the lower end thereof, substantially as described.

5. In a conveyer or chute for infilling material, the combination of a conduit or chute composed of separately-detachable sections rigidly connected together and having their ends telescoped into each other to make a tight joint and enable the conveyer or chute as a whole to be shifted bodily, laterally and vertically, means for suspending the conduit or tube to hang free, a support for the suspending means, and a receiver for and from which the material can be deposited into the upper end of the conduit or tube to be discharged at the lower end thereof, substantially as described.

6. In a conveyer or chute for infilling material, the combination of a sectional conduit or tube having its sections detachably connected together, and when connected having the entering ends of the sections interlocked, chains one on each side of the conduit or tube, a projecting catch on opposite sides of each section of the conduit or tube adapted to engage a link of the chain and detachably and independently connect each section of the conduit or tube to the chains, and a support for the chains at their upper ends, substantially as described.

THOMAS NICHOLSON.

Witnesses:
OSCAR W. BOND,
WALKER BANNING.

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446–447

No. 760,015. PATENTED MAY 17, 1904.

F. E. PARKER.

STOREHOUSE CONVEYER FOR GRAIN, &c.

APPLICATION FILED NOV. 27, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

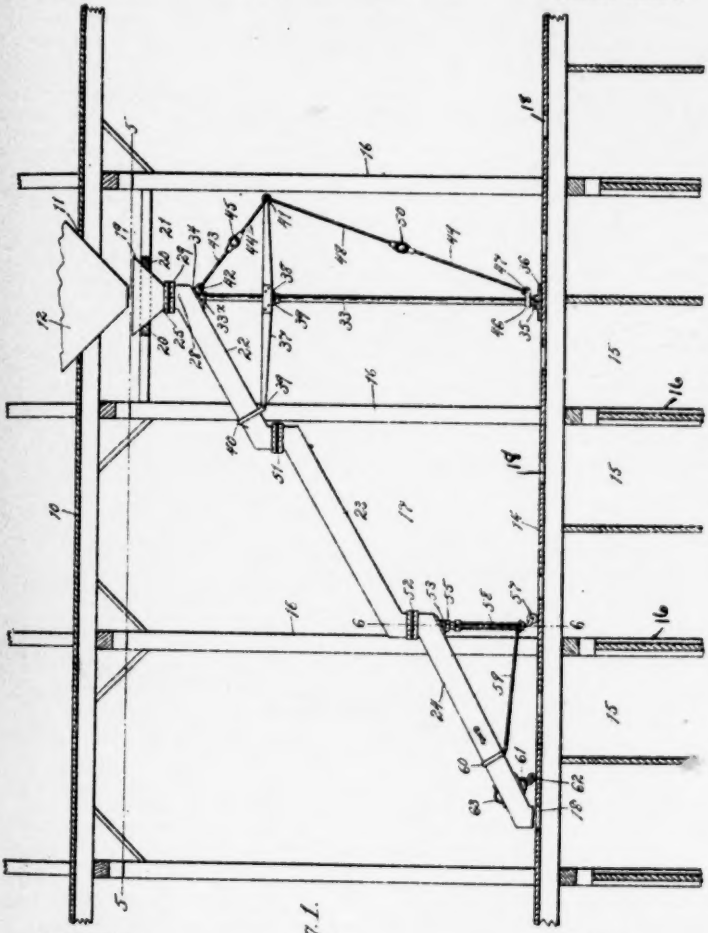


Fig. 1.

WITNESSES:

Robert A. Pollock

Theodore C. Sparkes.

INVENTOR.

Francis E. Parker

BY

Richard K. Manning

ATTORNEY.

812

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No. 760,015. PATENTED MAY 17, 1904.

F. E. PARKER.

STOREHOUSE CONVEYER FOR GRAIN, &c.

APPLICATION FILED NOV. 27, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

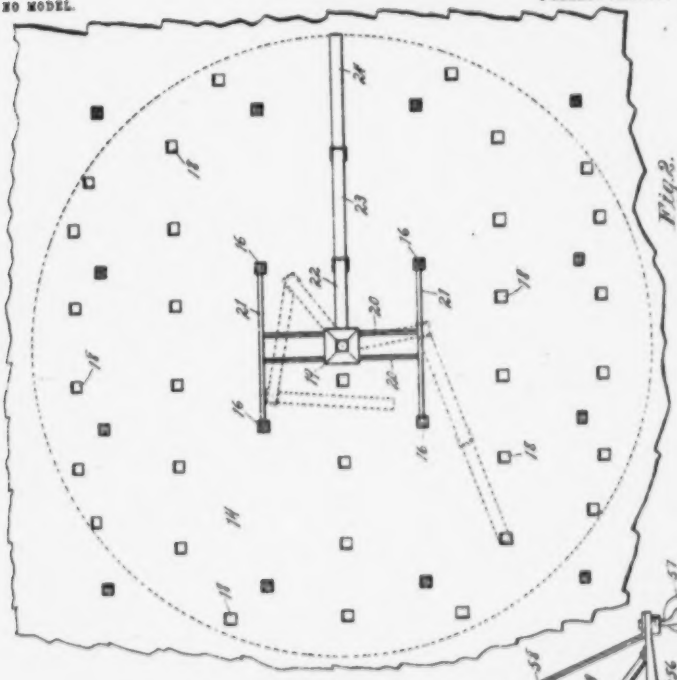


Fig. 2.

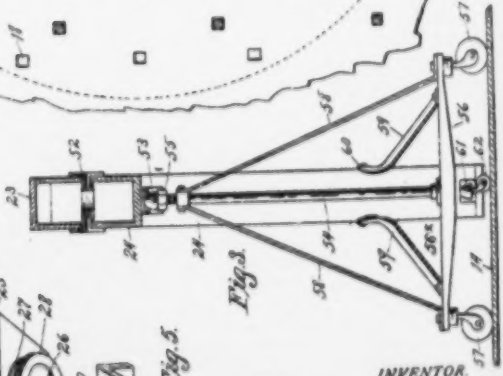


Fig. 3.



Fig. 4.



Fig. 5.

WITNESSES:

Robt. J. Pollock

Hudson C. Sparks.

INVENTOR.

F. Francis E. Parker

Richards & Manning

ATTORNEYS.

No. 760,015. Patented May 17, 1904.

UNITED STATES PATENT OFFICE.

FRANCIS E. PARKER, OF KANSAS CITY, MISSOURI, ASSIGNOR OF ONE-HALF TO JAMES C. MURPHY, OF KANSAS CITY, MISSOURI.

STOREHOUSE-CONVEYER FOR GRAIN, &c.

SPECIFICATION forming part of Letters Patent No. 760,015, dated May 17, 1904.

Application filed November 27, 1903. Serial No. 182,899. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS E. PARKER, a citizen of the United States of America, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Storehouse-Conveyers for Grain, &c.; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others to make and use the same, reference being had to the accompanying drawings, forming a part of this specification.

The object of my invention is to distribute by gravity the stored grain from the garner-floor of a storehouse to the various bins below and deploy the discharging end of the distributer within circles in the bays of the storehouse and from any point in the radius of a circle from its receiving end to support and adjust the separate portions of the distributer in position.

The invention consists in the novel construction and combination of parts, such as will be first fully described and then specifically pointed out in the claims.

In the drawings, Figure 1 is a view in vertical section of a portion of a storehouse for grain, showing separate garner and distributing floors, the hopper leading from the stored grain in the upper floor, the novel grain-distributer and its discharging end above the openings in the lower floor leading to one of the various bins. Fig. 2 is a horizontal sectional view taken upon the line 5 5 of Fig. 1. Fig. 3 is a rear view of the carriage supporting the lower discharging-section of the distributer, showing the adjusting devices, also showing a vertical section of the distributer through the joint of the connected parts, taken on the line 6 6 of Fig. 1. Figs. 4 and 5 are detail views of the castings forming the rotative joint at the ends of the spout-sections.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

Referring to the drawings, 10 represents the upper or garner floor of the storehouse from which the grain is distributed. In the floor 10 is an opening 11; through which extends a short distance the lower end of a hopper 12. Beneath the floor 10 is a floor 14, and beneath the floor 14 are the series of bins 15. The floors 10 and 14 are supported by columns or standards 16, arranged in a vertical position one above another and at equal distances apart in the longitudinal and transverse directions of the storehouse, the rectangular spaces or bays 17 between the columns being directly above two or more bins below the floor 14, and in the floor 14 within each bay 17 are separate openings 18 18, each above and leading to a bin 15.

Near the under side of the floor 10 and beneath the lower end of the hopper 12 is a hopper 19. This hopper is supported by the horizontal bars 20 20, which extend upon opposite sides and retain the hopper in a fixed position, the ends of the bars 20 20 being connected rigidly with the bars 21 21 extending at right angles thereto and secured to the standards 16 16.

The novel grain-distributer comprises the jointed sections or spouts 22, 23, and 24, which have rotative and pivotal bearings, as hereinafter described, and each spout is rectangular in cross-section. The spout-section 22, which is directly beneath the hopper 19, is preferably short in length, so as to permit of a movement in a circle at its lower end within the space or bay between the column 16, supporting the hopper 19, and from which the hopper is equidistant. At the lower end of the hopper 19 is secured a rectangular-shaped casting or box 25, extending around the lower end of the spout, in which is an opening 26, as seen in Fig. 4. Upon the under side of the ca g and extending around the opening 26 is a collar 27, upon the lower edge of which is an annular outwardly-extending flange 28, which forms the upper portion of the spout-joint. The upper end of the spout-section 22 is bent upwardly at an angle thereto, as at 28, and upon the outer side of said portion 28 is secured a casting or box 29, divided transversely into two parts, one of which parts is seen in Fig. 5, the top 30 being provided with a semicircular opening 31, which fits part way around

the collar 27 of the box 25 and forms the rotative suspension-joint for the upper end of the spout-section. Supporting the under side of the upper end of the spout-section 22 is a vertical rod 33, the upper end of which is square and extends within a socket 33° upon a cap-plate 34, secured to the spout. The lower end of the rod is reduced circumferentially in size to form a pivot 35, which is stepped in the bearing 36 upon the upper surface of the floor 14.

Upon the rod 33 a short distance below the upper end of rod 33 is a horizontal cantaliver 37, which is clamped to the rod by a strap 38 on the side of the beam extending over the rod. The cantaliver is supported by a fixed collar 39 on the rod beneath the strap 38. The longer arm of the cantaliver extends in the direction of the lower end of the spout-section 22 and is secured by a rivet 39 to the connected ends of a band 40, extending around said spout-section. The shorter end of the cantaliver extending from the rod is provided with an eye 41. Upon the cap-plate 34 is cast an eye 42. With the eyes 41 and 42 are connected the outer ends of separate adjusting truss-rods 43 44, the inner ends of which are provided with right and left hand screw-threads, which extend within a threaded link 45. Upon the lower end of the rod 33 is a clasp 46, in which is an eye 47. With the eye 41 on the cantaliver and the eye 47 is connected the outer ends of the separate truss-rods 48 and 49, the inner ends being connected with the adjusting-link 50, which is the same as link 45.

The lower end of spout-section 22 is bent downwardly and the upper end of the intermediate spout-section 23 bent upwardly, and these ends are connected by rotative joint 51, which is precisely the same as the joints 25 and 29. The lower end of spout-section 23 is bent downwardly, and with this end is connected the upwardly-bent upper end of the lower spout-section 24 by means of a rotative suspension-joint 52, which is the same in construction as the joints 51.

Upon the under side of the rear end of the spout-section 24 is secured a socket-plate 53, within which extends loosely the screw-threaded upper end of a supporting-rod 54. Upon the screw-threaded end of said rod is an adjusting-nut 55. The lower end of the rod 54 extends downwardly and is connected rigidly with the horizontal beam 56 of the carriage 56°, at each end of which beam are the rotatable caster-wheels 57 57, which are movable over the floor 14. With the outer ends of the beam 56 are connected the lower ends of the brace-rods 58, the upper ends of which rods are rigidly connected with the upper end of the rod 54 below the screw-threaded portion. With the beam 56 are connected the rear ends of brace-bars 59, the forward ends of which bars extend in the direction of the lower end of the spout-section 24 and are connected with the ends of a strap 60, which extends over the upper side of the spout-section.

Upon the under side and near the forward end of the spout-section 24 is a socket-plate and socket 61, in which the caster-wheel 62 is mounted and which retains the downwardly-bent lower end of the spout-section the requisite distance above the surface of the floor. Upon the said section of the spout are handles 63.

The grain in the hopper upon the garner-floor 10 is fed from the hopper 12 and thence to the hopper 19. The distribution of the grain to any one of the bins 13 through the spout-sections 22 23 24 and any of the openings 19 in the floor 14 is obviously within the reach of the discharging end of the lower spout-section 24 without any inconvenience from the columns 16 within the circuit of the distributer. This result is obtained by the carriage 56° acting as the pivot for the jointed ends of the spout-sections 23 and 24 to effect rotation and also effecting the withdrawal of the spout-sections within the space or bay in which the hopper is located, and thence deploying the spout-section forward in any direction in the circle to effect conjunction with either end of the openings in the floor 14. In these movements the intermediate spout-section 23 affords a capability of movement independent of the other spout-sections, which conduces to rapid change of positions and obviously as suspended so admit of freedom of movement. The rapid passage of the grain through the spout-sections, which has a tendency to cause vibration, is counteracted by the cantaliver 37, and any slight inaccuracy in position of the spout-section is readily corrected by the adjusting-links 45 and 50 on the truss-rods 44 and 48, which latter rods prevent buckling of the vertical rod 33. Should the position of the rear end of the spout-section 24 require adjustment, to prevent binding of the joint 52 the nut 55 may be turned so as to effect the adjustment the nut ordinarily supporting the weight of the jointed spout-sections 23 and 24.

The invention is applicable to the distribution of material of various kinds, it being observed that in large storehouses one distributer accomplishes the spouting of large quantities of cereals of various kinds into separate and distinct bins in an expeditious manner.

Such modifications may be employed as are within the scope of the invention.

Having fully described my invention, what I now claim as new, and desire to secure by Letters Patent, is—

1. In a distributer for grain, &c., the combination with a hopper, of a distributing-spout and a rotative joint connecting the spout with the hopper, a pivoted supporting-rod beneath the upper end of the spout, a cantaliver on the said rod supporting at one end the forward end of the spout and adjustable truss-rods on

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451–453

said supporting-rod connected with the other end of the cantaliver.

2. The combination with an elevated hopper, of a distributing-spout for grain, &c., having upper and lower and intermediate sectional parts, rotative suspension-joints connecting the contiguous ends of the separate parts of the spout with each other and also with the said hopper, a traveling support for the jointed ends of the lower and intermediate sectional parts of the spout, and means for raising and lowering said parts upon said support.

3. The combination with an elevated hopper, of a distributing-spout having upper and lower and intermediate sectional parts, rotative suspension-joints connecting the contiguous ends of the separate parts of the spout with each other and also with said hopper, a carriage beneath the jointed ends of the lower and intermediate sectional parts of the spout, a rod connected with the carriage and supporting said jointed ends of the spout, and a traveling support for the lower discharging end of the lower sectional part of the distributing-spout.

4. The combination with a distributing-spout for grain, &c., having sectional distributing parts, and the ends of each sectional part bent in opposite directions, of a boxing for each bent portion of the ends of said part, and rotative suspension-joints upon the boxing connecting the ends of the sectional parts of the spout.

FRANCIS E. PARKER.

Witnesses:
FRANCIS A. LEACH,
ALBERT C. STOWELL.

816

454–455

No. 769,126. PATENTED AUG. 30, 1904.

E. L. & A. C. ADAMS.

APPARATUS FOR LOADING GRAIN CARS.

APPLICATION FILED JAN. 23, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

Fig 1

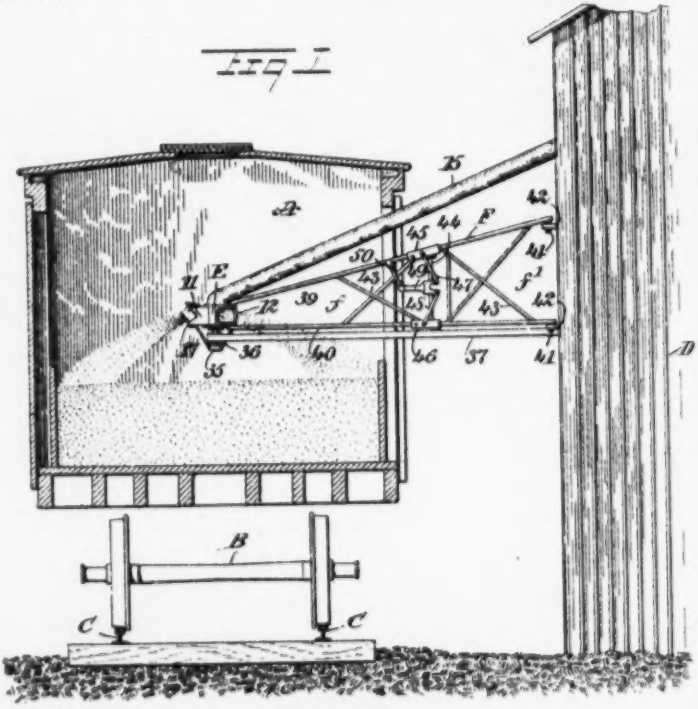
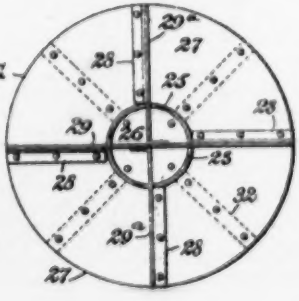


Fig 2



WITNESSES:

H. L. Walker

INVENTORS

Edwin L. Adams

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817

456

No. 769,126. PATENTED AUG. 30, 1904.

E. L. & A. C. ADAMS.

APPARATUS FOR LOADING GRAIN CARS.

APPLICATION FILED JAN. 23, 1904.

NO MODEL. 2 SHEETS—SHEET 2.

Fig 3

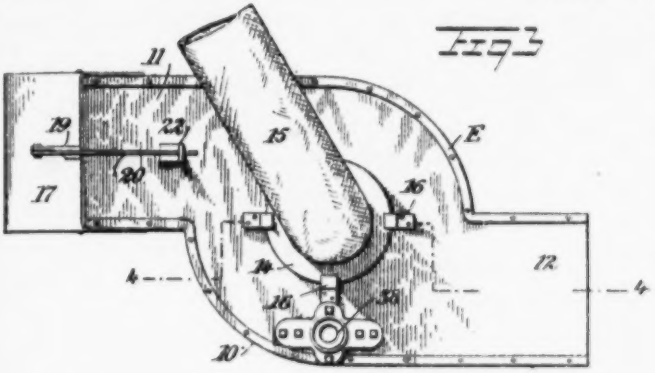


Fig 5

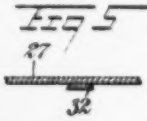


Fig 5

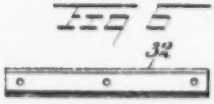


Fig 6

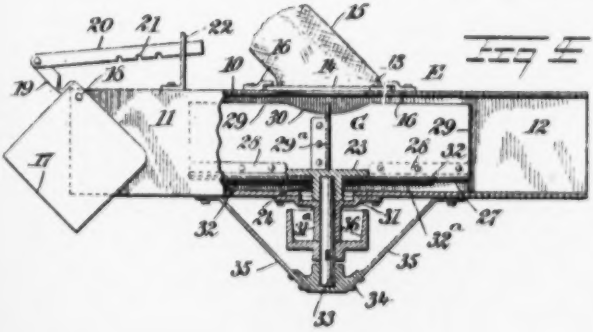


Fig 7



WITNESSES:

H. W. Walker

J. Bissell Adams

INVENTORS

Elwin L. Adams

Andy C. Adams

BY

ATTORNEYS

8:8

457

No. 769,126. Patented August 30, 1904.

UNITED STATES PATENT OFFICE.

EDWIN L. ADAMS AND ANDY C. ADAMS, OF EDGAR, NEBRASKA, ASSIGNORS OF ONE-THIRD TO AUGUST SEOVER, OF EDGAR, NEBRASKA.

APPARATUS FOR LOADING GRAIN-CARS.

SPECIFICATION forming part of Letters Patent No. 769,126, dated August 30, 1904.

Application filed January 23, 1904. Serial No. 190,494. (No model.)

To all whom it may concern:

Be it known that we, EDWIN L. ADAMS and ANDY C. ADAMS, citizens of the United States, and residents of Edgar, in the county of Clay and State of Nebraska, have invented a new and Improved Apparatus for Loading Grain-Cars, of which the following is a full, clear, and exact description.

The purpose of our invention is to provide a simple, durable, and economic form of apparatus especially adapted for loading grain into cars and to so construct the supply-head of the apparatus that the grain can be directed to any desired point in a car, so as to produce an automatic leveling of the grain and obviating the usual manual labor required for such purpose.

A further purpose of the invention is to provide a combined distributing and feed wheel within the supply-head which will act to receive the grain and force the same out in constant streams simultaneously at both ends of the supply-head, the said feed-wheel operating with the least possible amount of friction and so that any grain which may work its way beneath the feed-wheel will be thrown out with the burden of the grain at the delivery ends of the supply-head.

Another purpose of the invention is to provide a pivoted and folding support for the supply-head and a flexible tubular connection between said head and the source of grain-supply, enabling the apparatus to be quickly and conveniently introduced into a grain-car and withdrawn therefrom and likewise enabling the entire apparatus to be compactly folded adjacent to a receptacle containing the bulk of grain when the apparatus is not required for use.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a transverse section through a grain-car and a side elevation of an apparatus illustrated at work within the car. Fig. 2 is a plan view of the combined feed and distributing wheel. Fig. 3 is an enlarged plan view of the supply-head of the apparatus. Fig. 4 is a sectional side elevation of the supply-head, the section being taken substantially on the line 4 4 of Fig. 3. Fig. 5 is a detail section through a portion of the body of the feed and distributing wheel and a section through a clearance-bar connected therewith. Fig. 6 is a detail plan view of a clearance-bar, and Fig. 7 is a side elevation of the hub of the feed and distributing wheel.

A represents a portion of a grain-car, which may be of any desired type; B, an axle and wheels for the car; C, the tracks for the wheels, located on any suitable bed, and D a receptacle in which the grain is stored.

The apparatus consists mainly of a supply-head E and a support F, the latter being pivoted and constructed in sections to fold one section upon the other. The supply-head E, which is shown in enlarged views in Figs. 3 and 4, consists of a practically circular body-section 10, having outlets 11 and 12 at opposite sides. The shell of the head which has been described is hollow and within the body portion of the head a combined feed and distributing wheel G is mounted to rotate. At the upper central portion of the body 10 of the said supply-head E an opening 13 is made, and around this opening a flange 14 at the lower end of the flexible supply-pipe 15 is closely held on the body of the said supply-head by means of clamps 16, and the opposite end of the supply-pipe 15, as is indicated in Fig. 1, is connected with the source of grain-supply D at a point above the upper edge of the opening in the grain-car through which the said supply-head is introduced. A hood 17 is located at one or at both of the outlets 11 and 12 for the said supply-head E, and, as shown at the left in Fig. 4, the hood when employed is provided with a pivot 18, connecting it with the upper outer side portion of an outlet-section of the said head, and at the upper outer portion of the hood an arm 19 is secured, extending outward and upward from the hood. A link 20 is pivoted to this arm, provided

with notches 21 in its lower edge, adapted to engage with a keeper or rack-bar 22, secured upon the upper face of the said supply-head, so that by adjusting a link 20 the hood 17, connected with this link, may be given any desired inclination, enabling the grain passing through the outlet thus protected to be directed either upward or downward at a greater or a less inclination, as may be found necessary to automatically level the grain in the car.

The combined feed and distributing wheel G is mounted to turn beneath the central portion of the inlet-opening 13 at the top of the supply-head E. In the construction of said combined feed and distributing wheel G a hub 23 is employed, having a sleeve 24 extending downward from its upper portion 26, which is solid and in the form of a disk, and from the marginal portion of the upper portion 26 of the hub teeth 25 extend in an upward direction, each tooth having one straight edge and an opposing concaved edge, as is clearly shown in Fig. 7.

The body of the wheel G consists of a disk or circular plate 27, having an opening therein to fit loosely around the sleeve 24 of the hub 23, so that the said body plate or disk 27 of the wheel extends beneath the top portion 26 of the hub, as is clearly shown in Fig. 4.

At each quarter of the circle of the body-plate 27 of the wheel G a radial angle-iron 28 is secured in any suitable or approved manner. These angle-irons have bolted or otherwise secured thereto upwardly-extending blades 29 and 29*, the blades 29 being at right angles to the blades 29*. In fact, the two blades 29 and 29* intersect centrally at the upper portion of the hub 23. These blades pass between the teeth 25, so that as the hub 23 is revolved the blades 29 and 29* are carried around with the hub, carrying with them the body plate or disk 27. Preferably the blade 29 is in one piece, extending from side to side of the body plate or disk 27; but the blade 29* is usually made in two sections, connected at their inner ends and opposite sides to the central portion of the blade 29, as clearly shown in Fig. 2.

Where the blades 29 and 29* connect, concavities 30 are formed in the upper edges of the blades, as is shown in Fig. 4, to facilitate the distribution of the grain fed to the said wheel through the supply-pipe 15, as the blades 29 and 29* divide the wheel into compartments and grain is received in each of the compartments thus formed. The sleeve 24 of the hub 23 extends downward within a central depression 31 in the bottom of the body 10 of the supply-head E, as is shown in Fig. 4, and from this depression, which is provided with an opening, a sleeve 31* is downwardly carried, the bore of which registers with the opening in the depression 31. A space 32* is preferably formed between the bottom of the supply-head and the under face of the body-plate 27 of the wheel G, as is also shown in Fig. 4, in order that the said wheel may turn with the least possible amount of friction.

As the wheel revolves the grain located in the compartments of the wheel is carried by centrifugal force through the outlets 11 and 12 of the supply-head E in a continuous stream, as is illustrated in Fig. 1; but it may happen that some grain will lodge between the bottom of the wheel G and the bottom 10 of the supply-head E in the space 32* and serve to clog the said wheel. In order to expel any grain thus finding lodgment in the space 32*, clearance-bars 32 are secured to the under face of the body portion 27 of the wheel. The said clearance-bars are usually four in number, being located radially between the opposing members of the blades 29 and 29*, as is shown by dotted lines in Fig. 2.

In Figs. 5 and 6 the clearance-bars are shown more in detail, in which it will be observed that each clearance-bar is dovetail shape in cross-section, being narrowest at the top and widest at the bottom. As the wheel G revolves the fronts of the clearance-bars tend to discharge the air, while their back portions create practically a suction, so that the said clearance-bars will tend to lift the surplus grain, or the grain in the space 32*, and force it to one or the other of the outlets for the supply-head.

A shaft 33 extends up into the sleeve 24 of the hub 23, being attached to the said sleeve 24, and this shaft extends downward through the sleeve 31* of the body of the supply-head, and the lower end of the shaft 33 is mounted to turn in a bearing 34, supported by truss-bars 35 or their equivalents, which bars are attached to the bearing 34 and to the bottom of the supply-head E, as is shown in Figs. 1 and 5. A pulley 36 is secured to the shaft 33, and a suitable driving-belt 37 (shown in Fig. 1) is passed over this pulley and is carried to any suitable source of power.

At one side of the body 10 of the supply-head E sockets 38 are formed at the top and at the bottom of the head. These sockets are adapted to receive the outer ends of the upper members 39 and the lower members 40 of the pivotal support F for the said head, as is illustrated in Fig. 1. This support F is made, preferably, in two sections—an outer section *f* and an inner section *f'*. The inner section at the top and at the bottom is provided with pins 41 or their equivalents, and these pins enter suitable keepers 42, secured to the grain-receptacle D. Each section *f* and *f'* of the support is provided with suitable braces 43. The inner section *f'* of the support is preferably provided with a pivot-shaft 44 at its outer end, and the inner or opposing end of the section *f* of the said support is pivoted to this shaft, so that one section of the support

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may fold upon the other and both sections may be folded close to the receptacle D.

In order that the two sections *f* and *f'* may be held rigidly in alinement with each other when the supply-head is in use, shoes or clips 45 and 46, preferably U-shaped in cross-section, are pivoted, for example, to the upper and lower members of the outer section *f*, as is also shown in Fig. 1. When the two sections of the support are to be held rigidly together, these clips 45 and 46 cover the points of connection between the two sections. Links 47 and 48 connect the shoes or clips 45 and 46 with a shifting-bar 49, the connection being at one end of the shifting-bar, and the opposite end of the shifting-bar is connected by links 50 with, for example, the upper portion of the outer section *f* of the support. When the shoes or clips 45 and 46 are in position to hold the sections *f* and *f'* together, the shifting-bar 49, as is shown in Fig. 1, has a thrust in direction of the receptacle D. When it is desired to fold one of the supports upon the other and to remove the supply-head from the car, the shifting-bar 49 is moved in direction of the outer end of the support, which movement will simultaneously carry the clips or shoes 45 and 46 out from their locking engagement with the members of the support.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In an apparatus for loading grain-cars, a body-casing having outlets at opposite sides, adjustable hoods for the said outlets, a supply-pipe leading into the upper portion of the body-casing, a wheel provided with a disk-body mounted to revolve around the hub of the wheel, the said wheel being mounted to revolve in the body adjacent to the outlets, said wheel being also provided with upwardly-extending plates at angles to each other, dividing the said wheel into a number of compartments, open at the top to receive material from the supply-pipe, clearance-bars secured to the under face of the disk-body of the wheel, and a driving mechanism for the said wheel, as described.

2. In an apparatus for loading grain-cars, a body-casing having outlets at opposite sides, a supply-pipe leading into the body-casing at its center, a wheel mounted to revolve in the said body-casing beneath the supply-tube and adjacent to the outlets, the said wheel consisting of a hub, a disk-body mounted to revolve around the hub, teeth extending upward from the hub, blades extending upward from the body-disk of the wheel, passing across the toothed portion of the hub, and a driving mechanism for the said hub, which hub as it revolves imparts motion to the body-disk through the medium of the said blades, as specified.

3. In an apparatus for loading grain-cars, a body-casing having outlets at opposite sides, a supply-pipe leading into the body-casing at its center, a wheel mounted to revolve in said body-casing beneath the supply-pipe and adjacent to the outlets, the said wheel consisting of a hub, a disk-body mounted to revolve around the hub, teeth extending upward from the hub, blades extending upward from the body-disk of the wheel, passing across the toothed portion of the hub, a driving mechanism for the said hub, which hub as it revolves imparts movement to the body-disk through the medium of the said blades, hoods adjustably located at the outlets for the body-casing, and clearance-bars secured to the under face of the body-disk of the wheel, for the purpose described.

4. In an apparatus for loading grain-cars, a body-casing, a support for the same, the body-casing being provided with outlets at opposite sides, a supply-pipe connected with the said body-casing at its upper portion, a wheel mounted to revolve in the body-casing below the supply-pipe and in close proximity to the outlets, the said wheel comprising a disk-body, means for revolving the said body, upwardly-extending blades crossing the disk-body, being located at angles to each other, and clearance-bars dovetail shape in cross-section, secured to the bottom portion of the body, for the purpose described.

5. In an apparatus for loading grain-cars, a body-casing having an outlet, a supply-pipe leading into the body-casing, a combined feed and distributing wheel mounted to revolve in the body-casing beneath the supply-pipe and adjacent to the said outlet, the said wheel being provided with a series of open partitions and the said supply-pipe being of a flexible material, and a support pivotally connected with said body-casing, which support is constructed in pivotally-connected sections, locking devices for the said sections, and a shifting device for the locking devices, as described.

6. In an apparatus for loading grain-cars, a support for said apparatus, comprising two pivotally-connected sections, one adapted for pivotal attachment to a fixed support and the other being adapted for pivotal attachment to the apparatus, the two sections being pivotally connected, shoes adapted to embrace the sections at their points of pivotal connection, a shifting device for the said shoes, and link connections between the shifting device and the shoes, the links being at angles to one another when the shoes are in locking position, as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

EDWIN L. ADAMS.
ANDY C. ADAMS.

Witnesses:
W. R. WARD,
J. W. JONES.

821

462-463

No. 830,385. PATENTED SEPT. 4, 1906.

S. T. WALLACE.

HOIST.

APPLICATION FILED DEC. 23, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

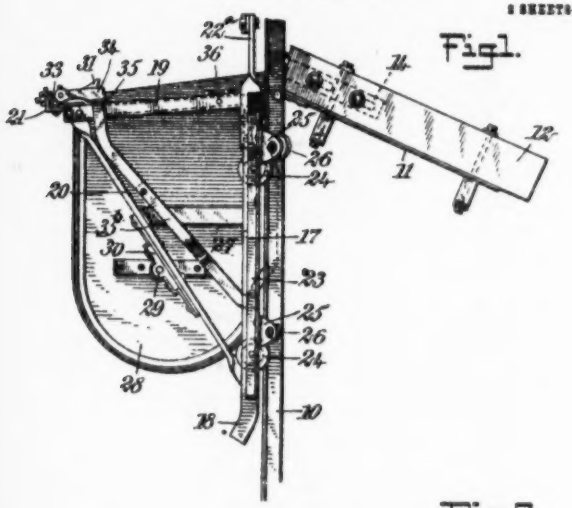
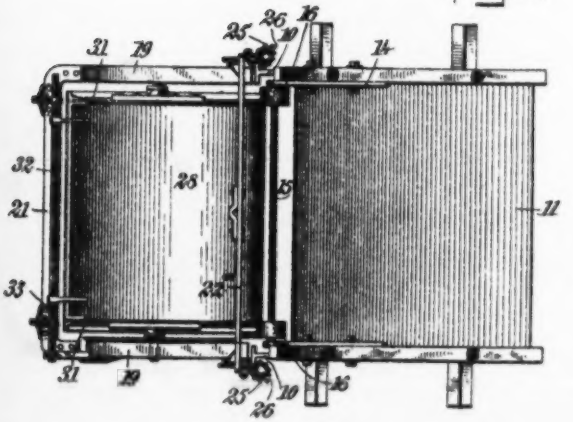


Fig. 2.



WITNESSES:

[signature]

[signature]

INVENTOR

Samuel T. Wallace

BY [signature]

ATTORNEYS

892

464

No. 830,385. PATENTED SEPT. 4, 1906.

S. T. WALLACE.

HOIST.

APPLICATION FILED DEC. 23, 1905.

2 SHEETS—SHEET 1.

Fig. 3.

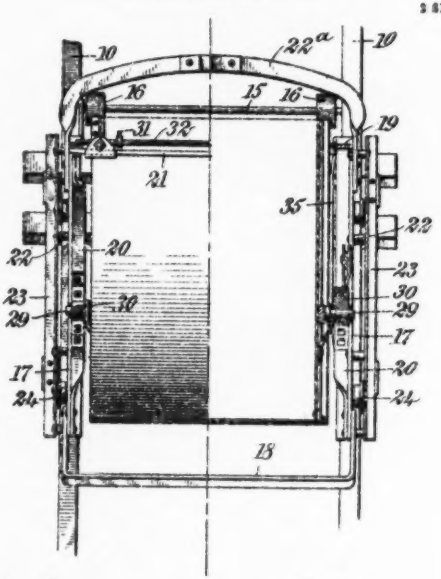


Fig. 4.

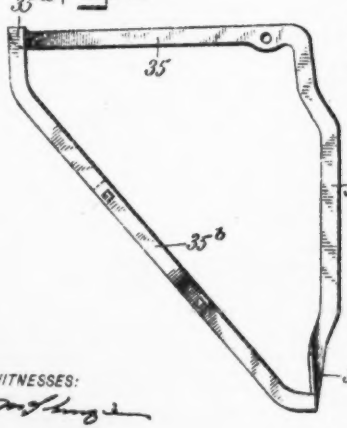


Fig. 5.



Fig. 6.



WITNESSES:

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INVENTOR

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UNITED STATES PATENT OFFICE.

SAMUEL THOMAS WALLACE, OF LOS ANGELES, CALIFORNIA.

HOIST.

No. 830,385. Specification of Letters Patent. Patented Sept. 4, 1906.

Application filed December 23, 1905. Serial No. 293,089.

To all whom it may concern:

Be it known that I, SAMUEL THOMAS WALLACE, a citizen of the United States, and a resident of Los Angeles, in the county of Los Angeles and State of California, have invented a new and Improved Hoist, of which the following is a full, clear, and exact description.

The invention relates to an improvement in the hoist forming the subject-matter of my prior patent, Serial No. 771,108, dated September 27, 1904.

The object of my present invention is primarily to adapt it to handling mortar, lime, cement, brick, and other material required to be carried in a hopper or bucket. In attaining this end I provide a carriage which is adapted to move along a vertical track and which mounts pivotally a bucket. Coacting with the bucket is a peculiar latch and trip, by means of which the bucket is held during the ascent and automatically released when the top of the track is reached, the bucket being pivoted off center, so that as the bucket is released the bucket automatically tilts and dumps its load.

The invention resides in certain special features, which will be fully set forth hereinafter, and particularly pointed out in the claims.

Reference is to be had to the accompanying drawings, which illustrate as an example the preferred embodiment of my invention, in which drawings—

Figure 1 is a side elevation of the invention, showing a bucket approaching the upper end of the track. Fig. 2 is a plan view of the parts shown in Fig. 1. Fig. 3 is a front elevation of the apparatus with a part in section. Fig. 4 is a side view of the trip. Fig. 5 is a front view thereof, and Fig. 6 is a detail of one of the latches.

As may be seen from my prior patent, the invention is intended for hoisting the material—for instance, for raising materials in a building in the course of construction.

10 indicates the vertically-extending stationary track, which is formed of two T-rails suitably braced. Near the upper end of the track is located a chute 11, which is sustained by a frame 12 and which is adapted to receive the load and direct the same into the building. In Fig. 1 the track is broken away at a point directly above the frame 12, but in practice the track will extend a relatively greater distance above the chute—for example, approximately four feet. Carried by the frame 12 are adjustable bearings 14, which sustain a horizontal shaft 15, carrying trip-rollers 16, the operation of which will be hereinafter fully set forth.

Adapted to move on the vertical track 10 is a carriage which, as shown in Figs. 1, 2, and 3, comprises vertical side beams 17, to the lower ends of which is fastened a transversely-extending bottom brace 18. Said side beams 17 extend upwardly and are thence bent outward horizontally to form top frames 19. Said frames 19 are fastened to diagonal braces 20, (best shown in Fig. 1,) which extend downward and are fastened to the lower ends of the side frames 17. The outer ends of the top frames 19 are also connected by a cross-brace 21, riveted in place.

22ª indicates a bail, the ends of which are riveted or otherwise fastened to the side frames 18. Connected by stay-bolts 22 to the side frames 17 are bars 23, which extend vertically on each side of the carriage and are constructed preferably of angle-iron, as shown. Located between the bars 23 and the side frames 17 are rollers 24, which run on the track 10, the journals of said rollers being held in the parts 17 and 23, said rollers being arranged two at each side of the carriage. Attached to each bar 23 are two brackets 25, which are diagonally disposed, as shown best in Fig. 2, and carry beveled and flanged rollers 26. These rollers engage the rear sides of the rails 10, so that the carriage is securely held on the track and prevented from any movement independently thereof, except a vertical movement along the track. A suitable connection is joined to the bail 22ª to permit elevating the carriage. The braces 20 are further strengthened by means of struts 27, which extend from the braces inward to the respective side frames 17 and are fastened to said parts. The bucket 28 may be of any desired construction and is here shown with a rounding bottom and an open upper end. The bucket has studs 29, fastened to each side at a point outward from the vertical center of the bucket, and these studs or trunnions are mounted in bearings 30, attached, respectively, to the braces 20, so that the bucket is free to turn around the center of the trunnions into dumping position. Since said trunnions are located outward from said center of the bucket, the weight of the bucket and its load will cause the bucket to auto-

matically tilt as soon as the devices for holding the bucket, which will be hereinafter described, are released. Said bucket is held releasably in upright or normal position by means of two latches 31, which are fastened on a rock-shaft 32, held in bearings 33, and these bearings are in turn sustained by the front brace 21, before described. Fastened to one end of the rock-shaft 32 is an arm 33, and this is adapted to be struck by the trip or trigger 35, which is shown best in Figs. 4 and 5. Said trip is located at the side of the bucket in which the arm 34 is located, and the trip is pivoted to the adjacent top frame 19 by means of a pin 36. (See Fig. 1.) The trip is triangular in general form, its upper run lying just inward of the top frame 19, as shown by the dotted lines in Fig. 1, and thence bending laterally, as indicated at 35^a, so as to pass outside of the top frame. The trip then extends downward and inward, and the diagonal run of the trip has a loop 35^b formed therein, which loosely receives the adjacent strut 27. The lower end of said diagonal run is joined by a twist 35^c to the vertical run, and this vertical run is formed with an offset portion 35^d, which is adapted to strike the trip-roller 16, so as to operate the trip when the carriage reaches its elevated position. Normally the trip hangs by gravity in inactive position, (shown by Fig. 1,) the bend 35^a of the trip lying under the arm 34, so that when this part of the trip is thrown up the shaft 32 will be rocked, so as to lift the dogs 31 and release the bucket.

In the operation of the invention the parts are assembled as shown in the drawings, and the carriage with the loaded bucket is raised along the track 10. The parts are so arranged that when the bucket reaches a point level with the chute 11, so that the load of the bucket may be properly dumped in the chute, the offset portion 35^d of the trip will run into engagement with the adjacent trip-roller 16. This will throw the trip outward and raise the bend 35^a, thus rocking the shaft 32 and disengaging the dogs 31. The bucket then tilts by gravity forward and empties its load on the chute 11. When the bucket has been emptied, the carriage should be allowed to descend, the rollers 16 then engaging the bucket and throwing it back to the upright position shown. As this operation takes place the front edge of the bucket strikes the dogs 31 and passes under them, allowing the dogs to fall and retaining the bucket in place until the trip is again actuated to release the dogs.

Having thus described the preferred form of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a vertical track, a carriage arranged to move thereon, a dumping-bucket mounted on the carriage, a dog adapted to hold the bucket in active position, a trip arranged to release the dog, whereby to dump the bucket and means for automatically operating the trip.

2. The combination of a vertically-extending track, a carriage adapted to move thereon, a dumping-bucket mounted on the carriage, a dog for retaining the bucket in active position, a chute at the upper portion of the track, and means for automatically releasing the dog whereby to dump the bucket to throw the contents thereof on the chute.

3. The combination of a vertically-extending track, a chute at the upper portion thereof, a carriage arranged to move on the track, a dumping-bucket mounted on the carriage, a latch adapted to releasably hold the carriage in active position, a trip arranged to release the latch, and means adjacent to the chute for actuating the trip.

4. The combination of a track, a carriage arranged to move thereon, a dumping-bucket mounted on the carriage, a dog adapted to releasably hold the bucket, a trip pivotally mounted on the carriage and adapted to actuate the dog, and a stationary trip-operating member located alongside of the track to be engaged by the trip.

5. The combination of a track, a carriage arranged to move thereon, a dumping-bucket mounted on the carriage, a dog adapted to retain the bucket in active position, a triangular trip pivotally mounted on the carriage and adapted to actuate the dog, said trip having an offset portion, and a stationary operating member adapted to be engaged by said offset portion of the trip.

6. The combination of a track, a carriage arranged to run thereon, a dumping-bucket mounted on the carriage, a rock-shaft mounted on the carriage, a dog attached to the rock-shaft and releasably engaging the bucket, an arm also engaging the rock-shaft, a trip mounted on the carriage and engaging the arm, and means for automatically operating the trip.

7. The combination of a track, a carriage arranged to run on the same, a bucket pivotally mounted on the carriage at a point to one side of the vertical center of the bucket, whereby to cause the bucket to tilt, a latch adapted to retain the bucket in upright position, and means for automatically operating the latch.

8. The combination of a frame, a carriage adapted to run thereon, the carriage having side frames, outwardly-extendi ngtop frames, and diagonally-extending braces connecting the outer ends of the top frames with the lower ends of the side frames, bearings carried by said braces, a bucket pivotally mounted in said bearings, and a releasable means for retaining the bucket in upright position.

9. The combination of a track, a carriage having side frames, and side bars located

outwardly and spaced from the side frames, rollers mounted on the carriage between said side frames and bars and engaging the track, brackets attached to the side bars, rollers carried by the brackets and adapted to engage the back of the track, and a bucket mounted on the carriage.

10. The combination of the vertical track, a chute projecting outwardly from the upper portion thereof, a carriage arranged to run on the track, a bucket pivoted below its horizontal center to the carriage, means for retaining the bucket in an upright position, and means for automatically releasing the retaining means whereby to dump the bucket, when said bucket reaches a position opposite the chute.

11. The combination of a vertical track, a chute located near the upper end thereof, a carriage adapted to run on the track, a bucket pivotally mounted on the carriage at a point to one side of the vertical center of the bucket, for the purpose specified, means for releasably holding the bucket in upright position, and devices for automatically releasing said means as the bucket reaches a position opposite the chute.

12. The combination of a track, a carriage arranged to run thereon, a dumping-bucket mounted on the carriage, a latch adapted to hold the bucket in upright position, a trip pivotally mounted on the carriage, the trip having a loop therein adapted loosely to receive a part of the framing of the carriage, said trip being adapted to operate said latch, and means for automatically actuating the trip.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL THOMAS WALLACE.

Witnesses:

E. B. LINDESMITH,

C. E. GILHOUSEN.

826

470-471

No. 862,874.

PATENTED AUG. 13, 1907.

J. BEACH.

PORTABLE ELEVATOR.

APPLICATION FILED AUG. 1, 1906.

2 SHEETS—SHEET 1.

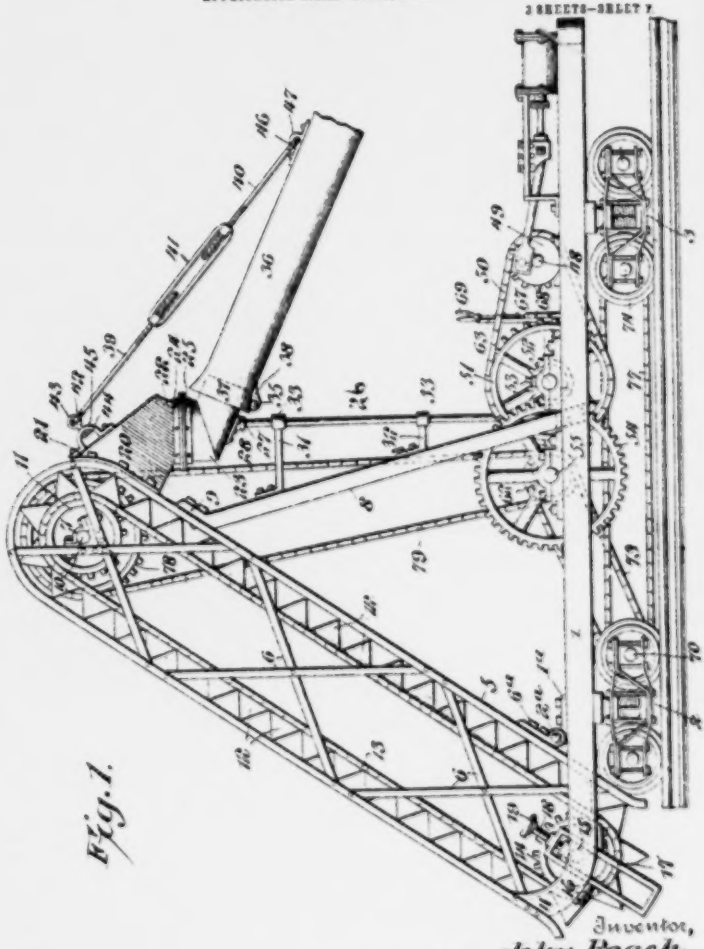


Fig. 1.

Witnesses

Howard D. Orr

J. H. Peley

Inventor,

John Beach,

By E. L. Siggers

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472-473

No. 862,874. PATENTED AUG. 13, 1907.

J. BEACH.

PORTABLE ELEVATOR.

APPLICATION FILED AUG. 1, 1906.

3 SHEETS—SHEET 2.

Fig. 6.

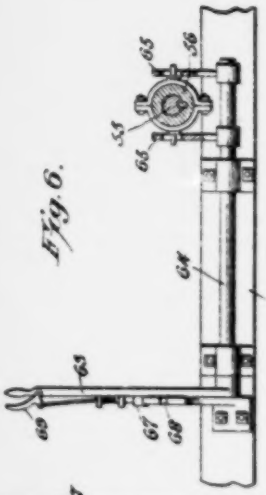


Fig. 7.



Fig. 8.

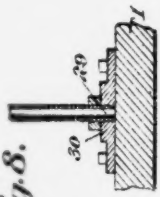
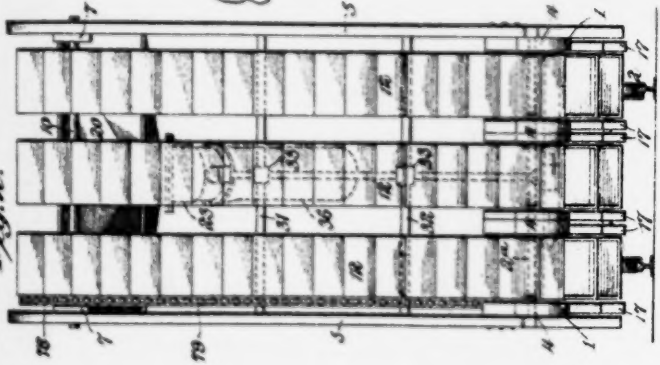


Fig. 2.



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474

No. 862,874. PATENTED AUG. 13, 1907.

J. BEACH.

PORTABLE ELEVATOR.

APPLICATION FILED AUG. 1, 1906.

2 SHEETS—SHEET 2

Fig. 3.

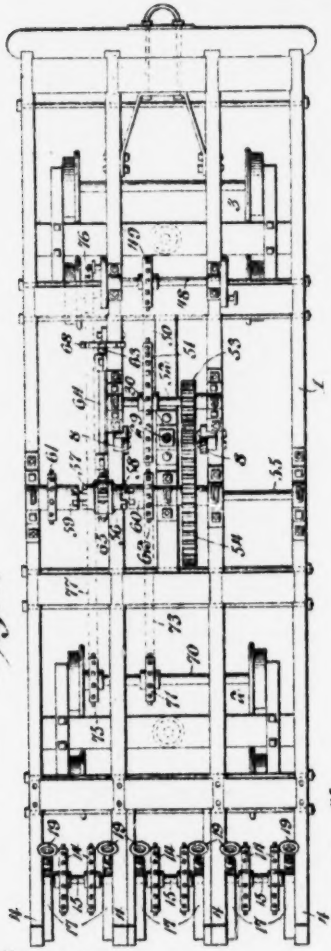


Fig. 5.

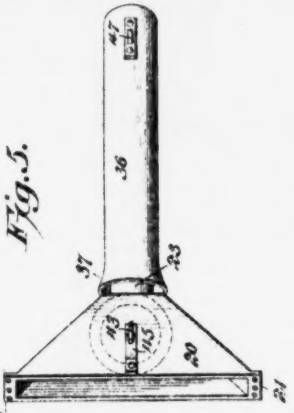
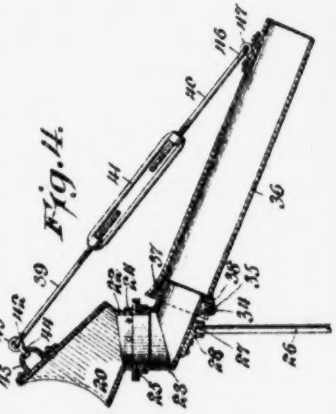


Fig. 4.



Witnesses
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John Beach,
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UNITED STATES PATENT OFFICE.

JOHN BEACH, OF HARWOOD MINES, PENNSYLVANIA.

PORTABLE ELEVATOR.

No. 862,874. Specification of Letters Patent. Patented Aug. 13, 1907.

Application filed August 1, 1906. Serial No. 328,796.

To all whom it may concern:

Be it known that I, JOHN BEACH, a citizen of the United States, residing at Harwood Mines, in the county of Luzerne and State of Pennsylvania, have invented a new and useful Portable Elevator, of which the following is a specification.

The invention relates to improvements in portable or traveling elevators.

The object of the present invention is to improve the construction of traveling or portable elevators, and to provide a simple and comparatively inexpensive elevator designed for handling various loose materials in bulk, and adapted to rapidly elevate the same from a bank or pile for loading cars or wagons, or for delivering the material to a conveyer line, or other place.

A further object of the invention is to provide an elevator of this character, having means for either moving it backward or forward to advance it into the material to be elevated, or for operating a plurality of endless conveyers for carrying the material upward.

Another object of the invention is an adjustable spout or chute, which will be capable of a vertical swinging movement and a horizontal rotary movement for discharging material in the desired direction, and at the desired elevation.

Furthermore the invention has for its object to provide a portable elevator adapted to deliver the material into a car either at the front, center or side thereof, and capable, when delivering the material into a car at the rear end thereof, of enabling the track, on which the elevator travels, to be used by the cars to be loaded.

With these and other objects in view, the invention consists in the construction and novel combination of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion, size and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:—Figure 1 is a side elevation of a portable or traveling elevator, constructed in accordance with this invention. Fig. 2 is a front elevation. Fig. 3 is a plan view of the car, partly in section. Figs. 4 and 5 are detail views, illustrating the construction of the adjustable discharge spout or chute. Fig. 6 is a detail view, illustrating the arrangement of the clutch operating member. Figs. 7 and 8 are detail perspective views, illustrating the manner of mounting the vertical pivot of the elbow of the chute.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

1 designates a main or car frame, composed of intermediate and side longitudinal beams and transverse connecting bars or beams, and mounted upon front and rear car trucks 2 and 3, which may be of any desired construction, and which may be provided with any desired number of axles and wheels, although in the accompanying drawings four-wheeled trucks are illustrated. In practice the front truck 2 is spaced a sufficient distance from the front end of the machine to enable sections of track to be laid in front of the machine for advancing the latter as the material is elevated. The longitudinal beams of the main or car frame are curved upwardly at their front ends 4, and an upwardly and inwardly inclined conveyer frame 5 is mounted on the front end of the main or car frame.

The conveyer frame, which may be of any desired construction, is provided at opposite sides with crossed inclined braces 6, and is rigidly secured at its lower end to the main or car frame, when it is in operative position, and in order to enable it to be lowered and folded for transportation, it is detachably secured by bolts, or other suitable fastening devices to the upwardly curved ends 4 of the beams of the main frame, and it is hingedly connected at its inner or rear side. The conveyer frame is provided at opposite sides of the main frame and also at opposite sides of the center thereof with brackets or plates 6^a, provided with eyes, which register with eyes of corresponding brackets or plates 1^a of the main or car frame. The eyes of the brackets or plates 1^a and 6^a receive a continuous pintle rod 2^a, which extends entirely across the machine. The hinged connection between the conveyer frame and the main or car frame permits the conveyer frame to swing downward upon the main or car frame, when the bolts or other fastening devices of its front or outer portion are removed, and when the braces 8 and the adjustable swinging chute and its supporting pivot, hereinafter described, are detached. The short lower shafts and the sprocket wheels thereof are also removed when the conveyer frame is to be lowered upon the main or car frame. The conveyer frame is adapted to be lowered upon the machinery hereinafter described, which does not have to be detached. The conveyer frame, which is provided at the top portion with opposite bearings 7, is also supported by inclined bracing bars or members 8, secured at their lower ends to the main or car frame at opposite sides thereof by bolts, or other suitable fastening devices and inclined upwardly and forwardly and provided at their upper terminals with angularly disposed portions 9, which fit against the adjacent inclined portions of the conveyer frame and are suitably secured to the same. By this construction the conveyer frame is rigidly supported in an inclined position over the car. The conveyer frame may be constructed of any desired height to adapt the machine for the character of work to be performed.

The bearings 7 receive an upper shaft 10, which extends entirely across the conveyer frame and which receives upper sprocket wheels 11 of a plurality of endless conveyers. The endless conveyers, which may be of any desired number, are located at opposite sides of the top and at the center of the space between the rails. The side conveyers are located above the rails and project beyond the same. In the accompanying drawings three are shown, one being located at the center of the front end of the car, and the other two being arranged at opposite sides of the central conveyer. The conveyers are provided with approximately triangular buckets 12, suitably secured to endless sprocket chains 13, which are arranged in pairs and which extend downwardly and forwardly from the upper sprocket wheels 11 to lower sprocket wheels 14. Each endless conveyer is provided at its lower end with an independent or separate shaft 15, journaled in adjustable bearings 16 to enable the slack in the chain of any one of the conveyers to be readily taken up. The adjustable bearings 16 are slidable in oblong frames or pedestals 17, which are arranged at an inclination and which extend a sufficient distance below the front of the main or car frame to enable the endless conveyers, when operating on a loose bank of material, to clear a space in advance of the front truck, of sufficient depth to receive the cross-ties and rails for extending the track in advance of the machine.

In practice the track will be laid in four or five foot sections, and there will be sufficient space between the front wheels and the elevators to permit a section of track to be placed in position for extending the track already laid. The central conveyer, which is arranged between the rails, and the side conveyers, which project laterally beyond the rails, are adapted to not only load the material upon the car, but they also clear a space sufficiently large for the machine to follow up its work without hand shifting.

When moving the machine from one place to another, the bottom buckets may be taken off. The bearings 16 are adjusted by means of screws 18, arranged at the upper ends of the guides and provided at their upper ends with hand wheels 19, or other suitable means for rotating them.

The lower portions of the endless conveyers extend downward from the front end of the car, and are adapted to engage any loose material in bulk, such as stored coal, loose earth, or the like, and the buckets are adapted to carry the material upwardly to an adjustable spout or chute. The buckets, in traveling over the upper end of the conveyer frame, are inverted to discharge their contents into a hopper shaped upper section 20 of the spout or chute.

The hopper shaped upper section 20, which tapers downwardly, is set at an inclination and is secured at its upper end to the conveyer frame. The upper end of the section 20 is provided with opposite laterally extending attachment flanges 21, which are bolted to the adjacent portions of the conveyer frame. The lower end of the upper section 20 is provided with a depending cylindrical neck 22, which fits in a rotary elbow 23, having a vertical upper portion and an inclined lower portion. The upper vertical portion receives the depending neck 22 of the hopper-shaped section 20, and the neck and elbow are provided with collars 24 and 25, arranged exteriorly of the said parts and provided with horizontal annular flanges, which fit against each other, whereby the elbow is capable of free rotary movement on the neck.

The elbow is supported by a vertical pivot, which has a round upper end 27 to fit in a depending socket 28 of the elbow. The depending socket 28, which is arranged vertically, as clearly illustrated in Fig. 4 of the drawings, is provided with an inclined attachment plate or portion, which is bolted or otherwise secured to the elbow. The upper end 27 is solid, but the rest of the vertical pivot 26 is preferably tubular, and is provided with a threaded lower end 29, which is screwed into a threaded socket 30 of the car frame. The threaded socket may be mounted on the car frame in any desired manner, and the vertical pivot is supported at an intermediate point by braces 31 and 32, having diverging arms or portions, which are secured to the inclined bars or members 8. The braces 31 and 32 are provided at their apexes with eyes 33 through which the vertical pivot passes.

The lower inclined portion of the elbow is provided with a depending eye 34, which receives a pivot or pintle 39, and the latter hinges a lower adjustable section 36 to the elbow. The lower adjustable section 36 of the spout or chute is arranged at an inclination and is provided with a flared upper end 37 to receive the lower end of the elbow, and it is provided at the bottom of the flared portion with a slot to receive the projecting eye 34, and it has eyes 38 at opposite sides of the slot for the reception of the pivot or pintle. The lower inclined section 36 of the spout is adapted to swing upwardly and downwardly, and is adjustably supported by means of a brace, composed of upper and lower rods 39 and 40 and a connecting turn buckle 41. The upper rod 39 is provided at its upper end with an eye 42, which is linked into a swiveled eye 43, whereby the brace is adapted to swing freely, when the elbow and the lower section 36 are moved horizontally. The swiveled eye 43 is provided with a pivot 44, which is arranged in a perforation or bearing opening of a substantially U-shaped bracket or member 45. The substantially U-shaped bracket or member 45 is mounted on the upper hopper shaped section 20 of the spout or chute, and it has terminal projecting portions secured to the same. The lower end of the lower rod 40 is provided with an eye 46, which is linked into an eye 47 of the bottom section 36 of the spout or chute. The inclined lower section is adapted to swing horizontally to extend it in any direction, and it is also adapted to be readily raised and lowered by means of the adjustable brace 41. The lower section 36 may be made of any desired length, and the conveyer is adapted to deliver the material into a car at the center or either end thereof, and when filling a car at the rear end thereof, the track on which the machine travels may be utilized for running the cars to be filled to and from the machine.

The machine may be propelled forwardly or backwardly and the conveyers operated by any suitable motor, which is designed to be coupled to a transverse crank shaft 48, and the latter carries a sprocket pinion 49, which is connected by a sprocket chain 50 with a large sprocket wheel 51 of a counter-shaft 52. The gears may be of any relative size to secure the desired power and speed. The counter-shaft 52 is provided with

a spur pinion 53, which meshes with a large spur gear 54 of a main transverse shaft 55, from which motion is communicated either to the car or to the endless conveyers.

Mounted on the transverse shaft is a slidable clutch section 56, having opposite clutch faces 57 and 58, which are adapted to engage corresponding clutch sections 59 and 60 of the sprocket pinions or gears 61 and 62. The movable clutch section 56 is slidably interlocked with the shaft, and it may be engaged with either of the clutch sections 59 and 60, or may be arranged at an intermediate point, as illustrated in Fig. 3 of the drawings. The clutch sections, as clearly illustrated in Fig. 3 of the drawings, are provided with projections and recesses to enable the sections to interlock when engaged with each other, but any other form of clutch may be employed, if desired. The clutch is operated by means of a shifting lever 63, mounted on a longitudinal rock shaft 64, which is provided at its front end with a pair of upwardly extending arms 65, located at opposite sides of the slidable clutch section, as clearly shown in Fig. 6 of the drawings. The shifting lever 63 carries a spring actuated detent or dog 67, arranged to engage a notched segment 68, and adapted to be operated by a latch lever 69, mounted on the shifting lever adjacent to the upper end thereof. The notched segment 68, which is suitably fixed to the main or car frame, is provided with central and side notches, for holding the slidable clutch section in engagement with either of the other clutch sections, or for maintaining the slidable clutch sections out of engagement with both of the other clutch sections, as clearly shown in Fig. 3 of the drawings, whereby the motor may operate without actuating either the car or the conveyers.

The main transverse shaft is connected with the rear axle 70 of the front truck by means of sprocket gearing, consisting of sprocket wheels 71 and 62, mounted respectively on the axle 70 and on the main transverse shaft and receiving a sprocket chain 73. The front axle 74 of the rear truck is positively driven by a sprocket gearing connecting the front axle of the rear truck to the rear axle of the front truck, and consisting of sprocket wheels 75 and 76, and a sprocket chain 77.

The main transverse shaft is connected with the upper shaft of the series of the endless conveyers by means of sprocket gearing, consisting of an upper sprocket wheel 78, the lower sprocket gear 61 and a sprocket chain 79. This gearing is located at one side of the machine, as clearly illustrated in Fig. 2 of the drawings, and is set in motion when the slidable clutch section is in engagement with the clutch section 59 of the sprocket gear 61.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A machine of the class described comprising a wheeled frame, an inclined conveyer frame rigidly mounted on the conveyer frame at one end thereof and extending upwardly and inwardly, a plurality of endless conveyers, a continuous shaft mounted on the conveyer frame at the upper portion thereof and receiving the said conveyers, and separate independently adjustable lower shafts mounted on the conveyer frame and receiving the said conveyers.

2. A machine of the class described comprising a main frame, a conveyer frame mounted on the main frame, a continuous shaft journaled on the conveyer frame at one end thereof, separate independently adjustable shafts journaled on the conveyer frame at the opposite end thereof, and a plurality of endless conveyers mounted on the said shafts.

3. In a machine of the class described, the combination with a track, of a wheeled frame adapted to run on the track, a plurality of endless conveyers consisting of a central conveyer located in the space between the rails of the track, and side conveyers operating above the rails, and means for operating the conveyers.

4. In a machine of the class described, the combination with a track of a wheeled frame designed to run on the track, a plurality of endless conveyers, the side conveyers of which are arranged to operate above the rails of the track, and means for operating the conveyers.

5. A machine of the class described comprising an inclined conveyer frame, a plurality of conveyers, an inclined downwardly tapered chute fixed at the top to the conveyer frame and having a neck at the bottom, a rotary elbow connected with the neck, and an adjustable section hinged to the elbow and arranged to swing vertically.

6. A machine of the class described comprising a conveyer, a chute fixed to the conveyer, a rotary section connected with the chute, an adjustable section pivoted to the rotary section and arranged to swing vertically, and an adjustable brace located above the adjustable section and connected with the same and with the chute.

7. A machine of the class described comprising a main frame, a conveyer having an inclined conveyer frame, braces mounted on the main frame and connected with the conveyer frame, a chute having an adjustable section arranged to rotate horizontally, a vertical pivot mounted on the main frame and supporting the adjustable section of the chute, and braces secured to the said braces and provided with eyes receiving the vertical pivot.

8. A machine of the class described comprising a conveyer, a chute having a fixed section and provided with an adjustable section arranged to swing vertically and horizontally, an adjustable brace connected with the adjustable section and provided with a pivot, and a bracket mounted on the fixed section and receiving a pivot of the adjustable brace.

9. A machine of the class described comprising a conveyer, a chute having a fixed section and provided with an adjustable section arranged to swing vertically and horizontally, an arched bracket mounted on the fixed section and projecting therefrom, and a brace connected with the adjustable section and having a pivot mounted on the arched bracket.

10. A machine of the class described comprising a conveyer having a frame, a chute composed of a hopper shaped section secured to the conveyer frame and having a neck, a pivotally mounted elbow connected with the neck, a bottom section hinged to the elbow, and adjustable means secured to the bottom section and pivotally connected with the hopper shaped section.

11. In a machine of the class described, the combination with a track, of a wheeled frame adapted to run on the track, a plurality of endless conveyers consisting of a central conveyer located in the space between the rails of the track, and side conveyers operating above the rails and extending laterally beyond the same, and means for operating the conveyers.

12. In a machine of the class described, the combination of a frame, car trucks supporting the frame and provided with wheels constructed to run on a track, a plurality of endless conveyers carried by the frame and consisting of a central conveyer located in advance of the space between the wheels of the trucks, and side conveyers operating in advance of the said wheels, and means for operating the conveyer.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN BEACH.

Witnesses:
CHAS. H. CRELLIN,
GEORGE F. BURKHARDT.

882

480–481

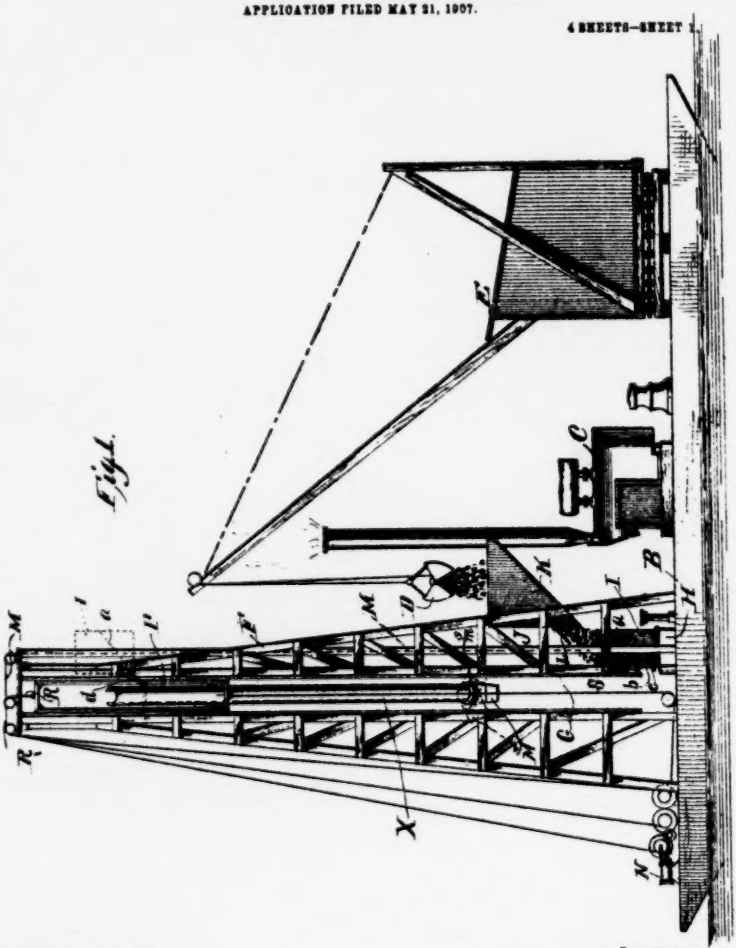
No. 866,166. PATENTED SEPT. 17, 1907.

G. W. THEISS, R. J. W. WHANN & W. J. ENGLISBEE.

LOADING AND UNLOADING APPARATUS.

APPLICATION FILED MAY 21, 1907.

4 SHEETS—SHEET 1.



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482-483

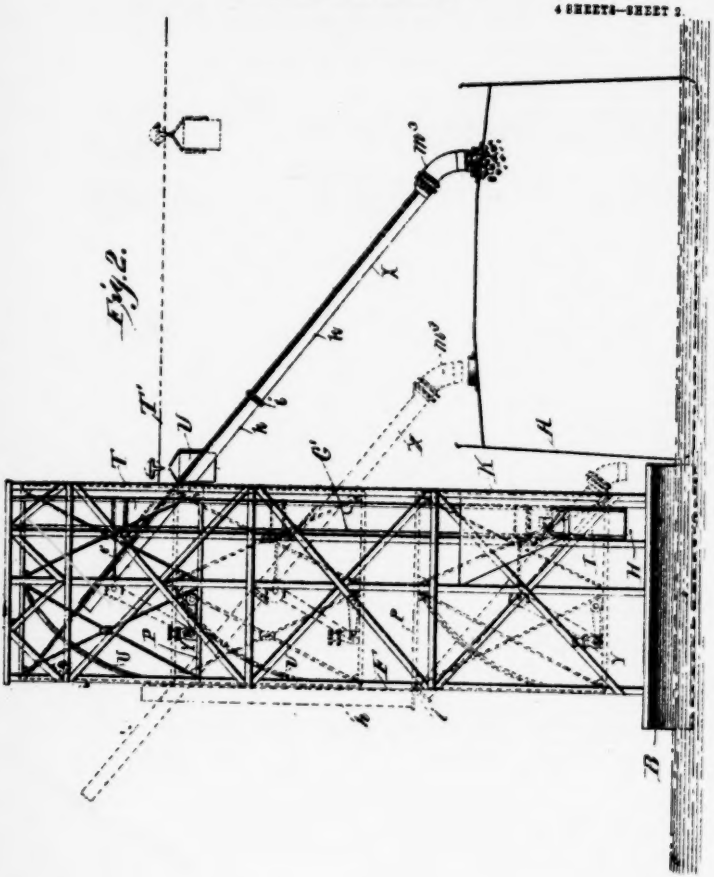
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G. W. THEISS, R. J. W. WHANN & W. J. ENGLISBEE.

LOADING AND UNLOADING APPARATUS.

APPLICATION FILED MAY 21, 1907.

4 SHEETS—SHEET 2.



WITNESSES:

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484–485

No. 866,166. PATENTED SEPT. 17, 1907.

G. W. THEISS, R. J. W. WHANN & W. J. ENGLISBEE.

LOADING AND UNLOADING APPARATUS.

APPLICATION FILED MAY 31, 1907.

4 SHEETS—SHEET 3.

Fig. 4.

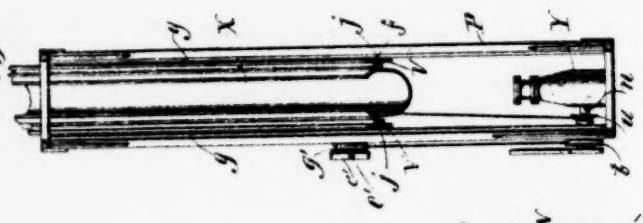
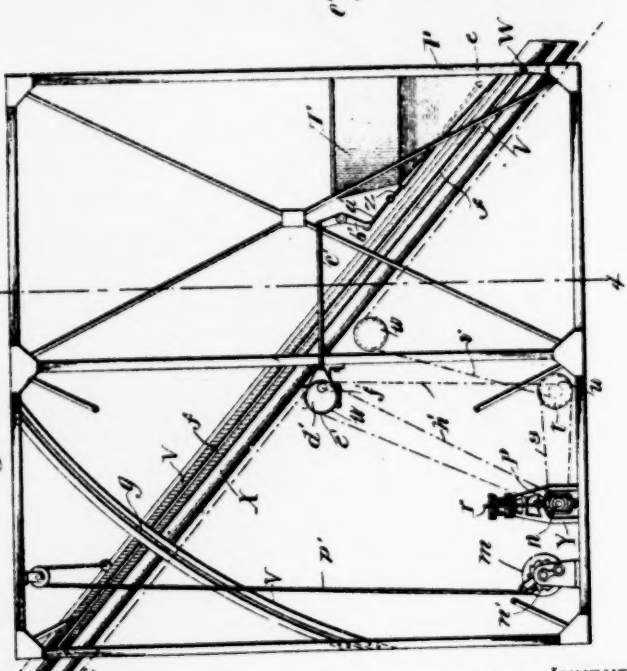


Fig. 5.



WITNESSES:

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486

No. 866,166. PATENTED SEPT. 17, 1907.

G. W. THEISS, R. J. W. WHANN & W. J. ENGLISBEE.

LOADING AND UNLOADING APPARATUS.

APPLICATION FILED MAY 21, 1907.

4 SHEETS—SHEET 4.



Fig. 6.

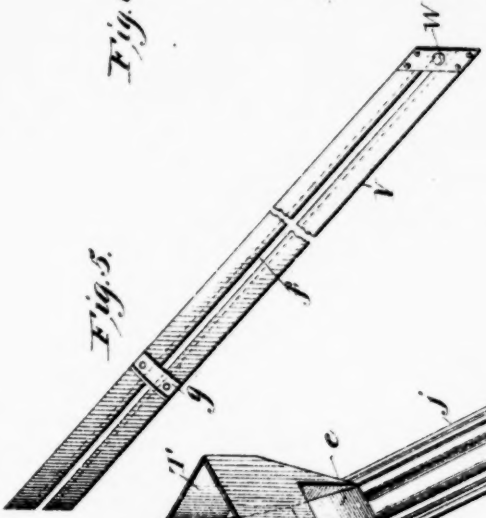


Fig. 5.

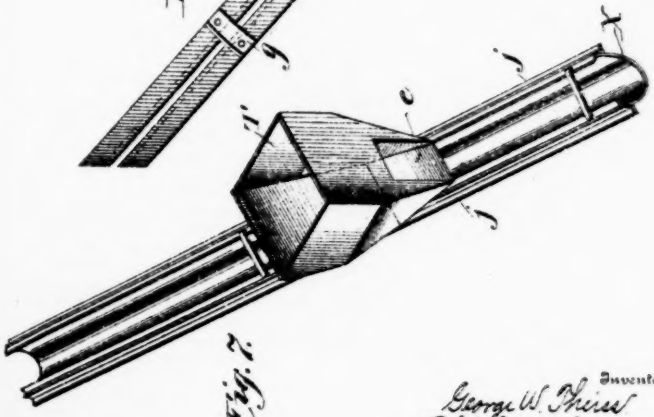


Fig. 7.

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487

UNITED STATES PATENT OFFICE.

GEORGE W. THEISS, OF PITTSBURG, PENNSYLVANIA, AND ROBERT J. W. WHANN AND WILLIAM J. ENGLISBEE, OF NEW ORLEANS, LOUISIANA.

LOADING AND UNLOADING APPARATUS.

No. 866,166. Specification of Letters Patent. Patented Sept. 17, 1907.

Application filed May 21, 1907. Serial No. 374,290.

To all whom it may concern:

Be it known that we, GEORGE W. THEISS, ROBERT J. W. WHANN, and WILLIAM J. ENGLISBEE, citizens of the United States, the former residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, and the two latter at New Orleans, parish of Orleans, State of Louisiana, have invented new and useful Improvements in Loading and Unloading Apparatus, of which the following is a specification.

Our invention pertains to loading and unloading apparatus and more particularly to loading and unloading apparatus for handling coal; and it has for one of its objects to provide a simple and efficient apparatus through the medium of which coal or other material may be expeditiously taken from a source of supply and elevated to various heights and there discharged into conveying means for taking it to the point desired.

Another object of the invention is the provision in a loading and unloading apparatus of a chute arranged to be positioned at various heights to receive coal or other material from the elevating means and also arranged to be swung vertically and adjusted in the direction of its length so as to position its discharge end at various distances from the vertical plane of the elevating means as circumstances require.

Another object is the provision in combination with the chute of a loading and unloading apparatus of a discharge nozzle connected with the discharge end of the chute in such manner that it is capable of being disposed in various directions to deflect the material being handled to different points about the discharge end of the chute.

Other advantageous features of our invention will be fully understood from the following description and claims when the same are read in connection with the accompanying drawings, forming part of this specification, in which:

Figure 1 is an elevation of the apparatus constituting the present and preferred embodiment of our invention. Fig. 2 is a view taken at a right angle to Fig. 1 and illustrating our apparatus in end elevation as properly arranged relative to a barge upon which coal is to be loaded, and also illustrating the vertically adjustable frame and the chute of the apparatus in various positions by full and dotted lines. Fig. 3 is a side elevation illustrating the vertically adjustable frame of the apparatus and the parts carried by said vertically adjustable frame as removed from the main frame. Fig. 4 is a transverse section taken in the plane indicated by the line 4–4 of Fig. 3, looking in the direction of the arrow. Fig. 5 is an enlarged detail view illustrating one of the vertically swinging supports and guides of the chute. Fig. 6 is an enlarged detail section showing the manner in which the said chute support and guide is pivotally connected with the vertically adjustable frame. Fig. 7 is a detail perspective view illustrating the arrangement of the hopper carried by the vertically adjustable frame and adapted to receive from the elevating receptacle, relative to the chute into which it is arranged to discharge material.

Referring by letter to the said drawings: A is a vessel upon which coal is to be loaded, and B is a barge upon which our novel apparatus is preferably, though not necessarily, arranged and carried; the said barge being designed to be arranged as shown in Fig. 2, relative to the vessel A, when coal is to be delivered to the latter.

C is a steam boiler arranged on the barge B and designed to supply steam for actuating the engines of the apparatus.

D is a clam-shell bucket for taking coal from a car or other source of supply and transferring the same to the storage bin, presently described, of our novel apparatus, and E is the means for raising and lowering the clam-shell bucket and swinging the same to and fro in horizontal planes; the said means E being carried by the barge B. The clam-shell bucket D and the means E may be and preferably are of the ordinary well known construction, and we have therefore deemed it unnecessary to illustrate and describe the said bucket D and means E in detail. In fact we would have it understood that while we prefer to employ the clam-shell bucket D and the means E for transferring coal to the before-mentioned storage bin, we do not desire to be understood as limiting ourselves to the said bucket and actuating means for the purpose, inasmuch as any transferring means consonant with our invention may be employed without involving departure from the scope of the invention as defined in the claims appended.

F is the main frame of our novel apparatus which is fixed to and rises to a considerable height from the barge B. The said main frame F may be of the general construction illustrated or of any other suitable general construction; and it is provided as best shown in Fig. 1 with a guideway G which extends between opposite sides thereof and is designed for the vertically adjustable frame presently described, and is also provided as best shown in Fig. 2 with a guideway G′ for the elevating receptacle presently described in detail.

At the lower end of the latter guideway G′ is arranged a scale H which may be of any suitable construction and is designed to weigh the coal deposited in the elevating receptacle I precedent to the raising of the said receptacle. The elevating receptacle I when in its lowermost position and on the scale H is positioned to receive coal from the discharge opening J of the fixed storage bin K; the said discharge opening J being controlled by a suitable door L so that when the said door is opened coal may pass from the bin to the

receptacle I after the manner shown in Fig. 1. We would also have it understood that in some cases the door L may be dispensed with, in which event coal discharged into the bin K will pass directly therethrough and into the elevating receptacle I.

The elevating receptacle I is connected through a cable M which passes over sheaves as shown in Fig. 1, with a hoisting engine N which *per se* forms no part of our invention and may therefore be of the ordinary well known construction or of any other elected construction. The elevating receptacle I is provided with an inclined bottom *a*, shown by dotted lines in Fig. 1; and it is also provided with a discharge opening *b* and a door *c* which normally closes the opening *b* to prevent coal from passing out of the receptacle. When, however, the receptacle I is raised to a predetermined height in the main frame F, the door *c* or an extension thereof brings up against a suitably positioned abutment *d* on the main frame and is moved by said abutment to an open position so as to permit coal to pass from the receptacle through the opening *b*. The abutment *d* is detachably connected to the main frame F and consequently it follows that said abutment may be positioned at various heights on the main frame F so as to effect the discharge of coal from the receptacle I at various heights.

P is the vertically adjustable frame of the apparatus which is arranged in the before-mentioned guideway G of the main frame F and is designed to be raised and lowered and adjustably fixed at various heights by the engine N through the medium of cables R and S past around sheaves as shown in Fig. 1. The said vertically adjustable frame P may be of the general structure illustrated or of any other suitable general structure without involving departure from the scope of our invention as claimed.

T is a hopper fixed to and carried by the vertically adjustable frame P and arranged in the position shown by full lines in Fig. 2 to receive coal from the discharge opening *b* of the elevating receptacle I and having a discharge opening *e*, best shown in Fig. 7, disposed at a right angle to the said discharge opening *b* of receptacle I. When the receptacle I is in the uppermost position shown in Figs. 1 and 2 and the door *c* thereof is open, the coal will obviously be chuted from the said receptacle I to the hopper T.

U U are slotted guideways which describe an arc of a circle and are spaced apart as best shown in Fig. 3 and are fixedly connected at their ends to the vertically adjustable frame P so as to be carried thereby.

V V are vertically swinging chute supports and guides which are pivoted at W to the vertically adjustable frame P at a point remote from the curvilinear guideways U and are of the form in cross-section shown in Figs. 4 and 6 so as to afford ways *f*, and are provided on their outer sides with shoes *g* of angular form in cross-section the outwardly directed portions of which are slidable in the curvilinear guideways U, and X is a chute which is open at its upper side throughout its length. The said chute X is preferably made up of sections *h* hinged together at *i*, and it is provided at diametrically opposite points with longitudinal ribs *j* which are disposed and movable endwise in the ways *f* of the chute supports and guides V, this in order to permit of the chute being moved endwise in order to discharge the coal at various distances from the vertical plane of the hopper T. From this it follows that by adjusting the vertically adjustable frame P and the chute X, the coal may be discharged into a bunker hole of a vessel at a point comparatively remote from the main frame F, as shown by full lines in Fig. 2, or may be discharged to the vessel at a point or points adjacent to the frame F as shown by dotted lines in said figure.

We prefer to raise the swinging ends of the chute supports and guides V through the medium of the mechanism illustrated in Fig. 3, but we do not desire to be understood as confining ourselves to the said mechanism inasmuch as any other mechanism suitable to the purpose may be employed without affecting our invention. The mechanism illustrated comprises a drum *m*, a ratchet mechanism *n'* for holding said drum against casual rotation, and a cable *p'* arranged on the drum and connected to one of the chute supports and guides V. The chute supports and guides V are connected together as shown in a manner that does not interfere with the endwise adjustment of the chute X therethrough; and by virtue of the mechanism described it will be seen that the supports and guides V may be moved to and adjustably fixed in different positions to pitch the chute X at various angles of inclination to adapt the said chute to discharge at the points desired.

At Y on the lower portion of the vertically adjustable frame P is located an engine, and on the drive-shaft *n* of the said engine is loosely mounted a clutch pulley *p* designed to be moved by a hand lever *r* into and out of engagement with a complementary clutch fixed on the said drive-shaft. The said pulley *p* is connected through a belt *s* with a pulley *t*, and with respect to the pulley *t* is fixed a drum *u* around which is looped a cable *v* which is passed over sheaves *w* and connected as indicated by *x* to widely separated portions of the chute X. By virtue of this construction it will be apparent that when the lever *r* is manipulated to put the clutch pulley *p* in engagement with the complementary clutch fixed on the drive-shaft *n* of the engine Y, the chute X will be moved endwise through the supports and guides V in one direction or the other according to the direction in which the engine shaft is caused to move, to extend the chute to a greater or less extent beyond the right hand side of main frame F, and that when the clutch pulley *p* is moved out of engagement with the complementary clutch on the shaft *n*, the chute X will be retained in the position in which it is placed.

Movable endwise through the back wall of the hopper T is a reciprocatory agitator Z which has for its office to facilitate the discharge of coal through the discharge opening *e* of the said hopper. This agitator Z is pivoted to a link *a'* and is connected through said link with one arm of a lever *b'*, Fig. 2, the other arm of which lever is pivotally connected to a rod *c'* which terminates in an eccentric strap *d'*. The said strap *d'* receives an eccentric *e'* on a shaft *f'* journaled in suitable bearings in the frame P, and in addition to the eccentric *e'* the shaft *f'* is provided with a pulley *g'*. This latter is connected through a belt *h'* with a pulley on the shaft *n* of the engine Y, and consequently it follows that when the engine is in action, the

shaft f' is rotated from the engine, and through the connection described the agitator Z is reciprocated by the said shaft f'.

As will be gathered from the foregoing the chute X rests under the hopper T and in the same vertical plane as the hopper discharge e, and hence it is obvious that when coal is discharged from the receptacle I into the hopper T, the coal will pass through the hopper T into the chute X and down the latter to the point of discharge.

In the general operation of the apparatus as thus far described, the clam-shell bucket D is employed to transfer coal from a car to the storage bin K, and the coal passes from said storage bin into the receptacle I when the latter is positioned as shown by full lines in Fig. 1. The receptacle I is then raised to the position shown by dotted lines in Fig. 1 when its contents will be discharged into the hopper T. From the hopper T the coal passes to the chute X, and by the latter it is conveyed to the point of discharge, the adjustable spout M^2 assisting in the latter function. The said discharge spout M^2 is swiveled on the lower end m^3 of the chute X, which lower end m^3 is of circular form in cross-section, and consequently it will be observed that by manipulating the said spout the coal may be deflected fore and aft of a vessel at the will of an attendant as well as directed downward.

It will be noted that by reason of the vertical adjustability of both the frame P and the chute X steam ships and other vessels of various heights above the water may be coaled with facility, and that the adaptability of the chute X to be extended to a greater or less extent beyond frame F is advantageous because it contributes to the facility with which coal may be properly placed in vessels of various widths. It will also be noted that the coal is conveyed to the bunker holes or hatches of vessels by gravity, and that the chute X may be placed at various angles of inclination when desired to regulate the flow of the coal.

In Fig. 2 of the drawings our novel apparatus is shown in proper relation to an elevated cable T' and a conveying receptacle U' movable on the said elevated cable. In the position illustrated the receptacle U' is arranged to receive from the discharge of the hopper T coal that is supplied to the hopper from the elevating receptacle I, and when filled the said conveying receptacle U' is moved by any suitable means along the cable T' to the point of discharge. This latter arrangement is obviously calculated to be used to advantage in handling coal on plantations and the like; the coal being transferred from cars to the elevating receptacle I in the manner before described in detail, and raised by the said receptacle and discharged by the latter into the hopper T from which it passes into the receptacle U' to be conveyed by the latter to the point at which it is stored.

It will be appreciated from the foregoing that notwithstanding the fact that our novel apparatus is possessed of large capacity and is adapted to be properly operated with but a minimum amount of attention, the apparatus is simple and inexpensive in construction and is also economical in operation.

By reference to Fig. 2 it will be seen that when the vertically adjustable frame P is in its lowermost position and the apparatus is idle, the upper section of the chute X may be positioned close against one side of the main frame F, this in order to lessen the liability of the chute fouling vessels or the rigging of vessels while the apparatus is being moved about a harbor.

Having described our invention, what we claim and desire to secure by Letters-Patent, is:

1. In a loading and unloading apparatus, the combination of a main frame having vertical guideways, a frame adjustable vertically in one of said guideways, means for adjusting and adjustably fixing the vertically adjustable frame, a hopper carried by the vertically adjustable frame, means for receiving material from the said hopper and conveying the same to a point of discharge, an elevating receptacle movable in the other guideway of the main frame and arranged when it reaches the proper position, relative to the hopper, to discharge its contents into said hopper, means for raising the elevating receptacle, and means for supplying material to said receptacle when the same is in a lower position.

2. In a loading and unloading apparatus, the combination of a main frame having vertical guideways, a frame adjustable vertically in one of said guideways, means for adjusting and adjustably fixing the vertically adjustable frame, a hopper carried by the vertically adjustable frame, means for receiving material from the said hopper and conveying the same to a point of discharge, a bin fixed with respect to the main frame and having a discharge, means for transferring material from a source of supply to the said bin, an elevating receptacle movable in the other guideway of the main frame and arranged in its lower position to receive from the bin and also arranged when it reaches the proper position, relative to the hopper on the vertically adjustable frame, to discharge its contents into said hopper, and means for raising the elevating receptacle.

3. In a loading and unloading apparatus, the combination of a frame, and a chute mounted in the frame and pivoted, whereby it is arranged to be swung vertically, and also arranged to be adjusted in the direction of its length with respect to the frame.

4. In a loading and unloading apparatus, the combination of a frame, a chute mounted in the frame and pivoted, whereby it is arranged to be swung vertically, and also arranged to be adjusted in the direction of its length, means for swinging the chute vertically and adjustably fixing the same at various angles of inclination, and means for adjusting the chute in the direction of its length and adjustably fixing it against endwise movement.

5. In a loading and unloading apparatus, the combination of a frame, a vertically swinging support and guide pivoted to the frame, means for adjustably fixing said support and guide at various angles of inclination, a chute carried by and arranged to swing with said guide and support and also arranged to be adjusted endwise on the guide and support, and means for adjustably fixing the chute with respect to the guide and support.

6. In a loading and unloading apparatus, the combination of a frame, a vertically swinging support and guide pivoted to the frame, means for swinging said support and guide vertically and adjustably fixing the same at various angles of inclination, a chute carried by and arranged to swing with said guide and support and also arranged to be adjusted endwise on the guide and support, and means for adjusting the chute endwise and adjustably fixing the same with respect to the guide and support.

7. In a loading and unloading apparatus, the combination of a frame, a vertically swinging support and guide pivoted to the frame, means for adjustably fixing said support and guide at various angles of inclination, a chute carried by and arranged to swing with said guide and support and also arranged to be adjusted endwise on the guide and support, a motor, a drum, a cable arranged to be moved by the drum and connected to opposite portions of the chute, and means for making and interrupting connection between the motor and the drum.

8. The combination in a loading and unloading apparatus, of a frame, an endwise adjustable chute mounted in

the frame, a motor, a drum, a cable connected with opposite portions of the chute and arranged to be moved by the drum, and means for making and interrupting connection between the motor and the drum.

9. The combination in a loading and unloading apparatus, of a main frame having a vertical guideway, a vertically adjustable frame disposed in said guideway, means for adjusting and adjustably fixing said vertically adjustable frame, a hopper carried by the vertically adjustable frame, means for elevating the material and discharging the same into the hopper, means for receiving material from the hopper and conveying the same to a point of discharge, a motor mounted on the vertically adjustable frame, a shaft bearing an eccentric and connected with the motor; said shaft being journaled in the vertically adjustable frame, a lever fulcrumed on the vertically adjustable frame, a rod connected with one arm of said lever and having a strap receiving the eccentric, and a reciprocatory agitator connected with the other arm of the lever and working through a wall of the hopper.

10. The combination in a loading and unloading apparatus, of a frame, a guide and support carried by said frame, a chute carried by and adjustable lengthwise on the guide and support and comprising sections hinged together at their meeting ends, and means for adjustably fixing the chute with respect to the guide and support and the frame.

11. In a loading and unloading apparatus, the combination of a frame, arcuate guideways connected to the frame, vertically swinging guides and supports pivoted to the frame and having shoes disposed in the arcuate guideways and also having guideways at their inner sides, means for adjustably fixing the said guides and supports, a chute having ribs at opposite sides disposed and movable endwise in the guideways of the guides and supports, whereby the chute is adjustable endwise on the guides and supports, and means for adjustably fixing the chute against endwise movement.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

GEORGE W. THEISS.
ROBERT J. W. WHANN.
WILLIAM J. ENGLISBEE.

Witnesses as to George W. Theiss:
J. FRANK TILLEY.
J. M. RUSMISSEL.

Witnesses as to Robert J. W. Whann and William J. Englisbee:
J. N. EDWARDS.
LOUIS P. BRYANT.

840

492-493

No. 875,529.

PATENTED DEC. 31, 1907.

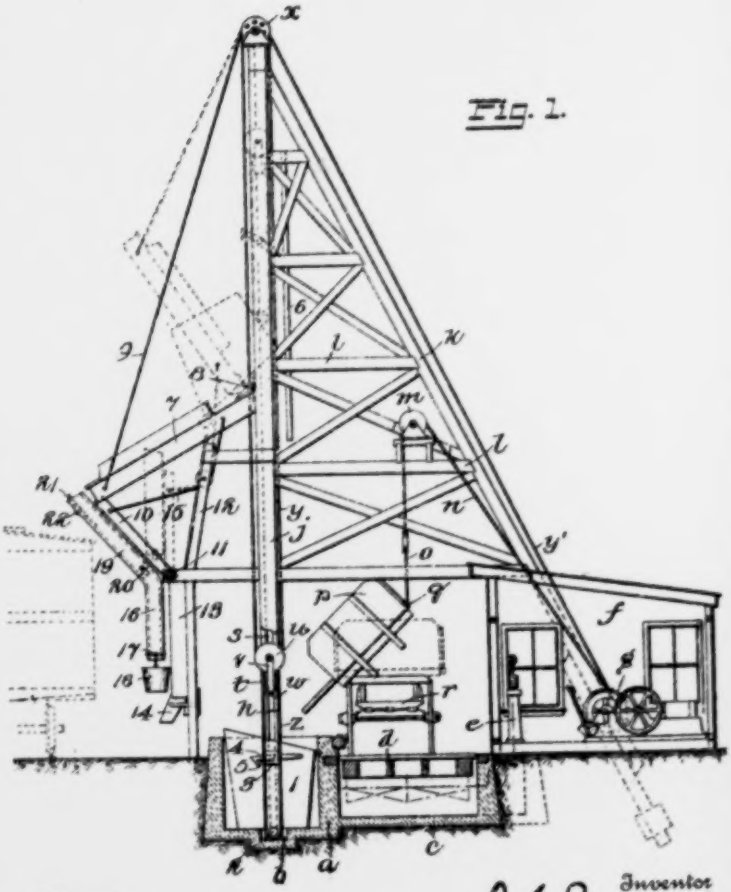
D. L. JOEHNCK.

APPARATUS FOR HANDLING BEETS.

APPLICATION FILED APR. 22, 1907.

3 SHEETS—SHEET 1.

Fig. 1.



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841

No. 875,529. 494-495 PATENTED DEC. 31, 1907.

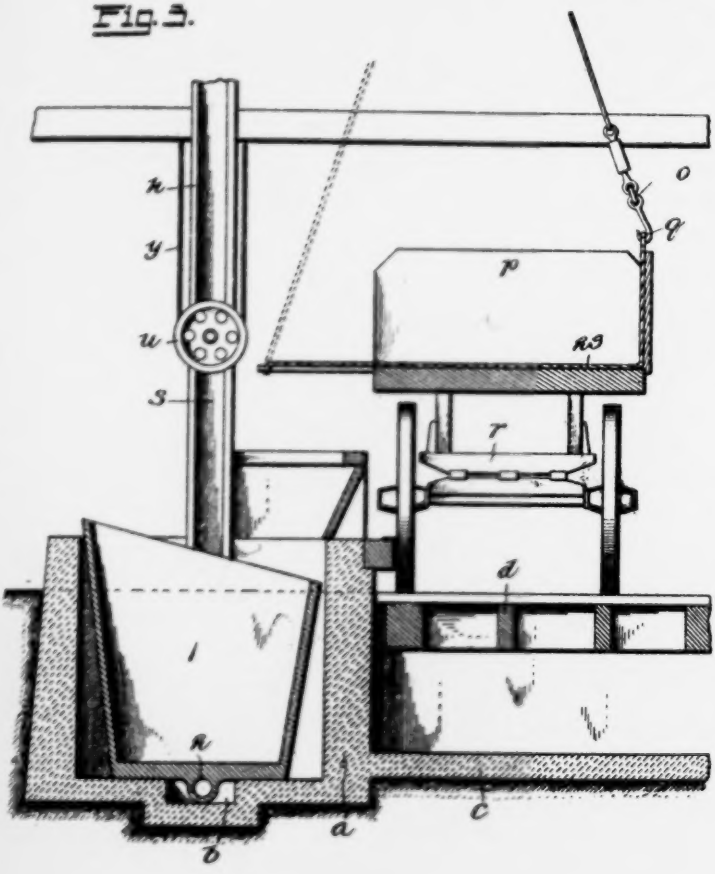
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APPARATUS FOR HANDLING BEETS.

APPLICATION FILED APR. 22, 1907.

2 SHEETS—SHEET 2.

Fig. 3.



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496

No. 875,529. PATENTED DEC. 31, 1907.

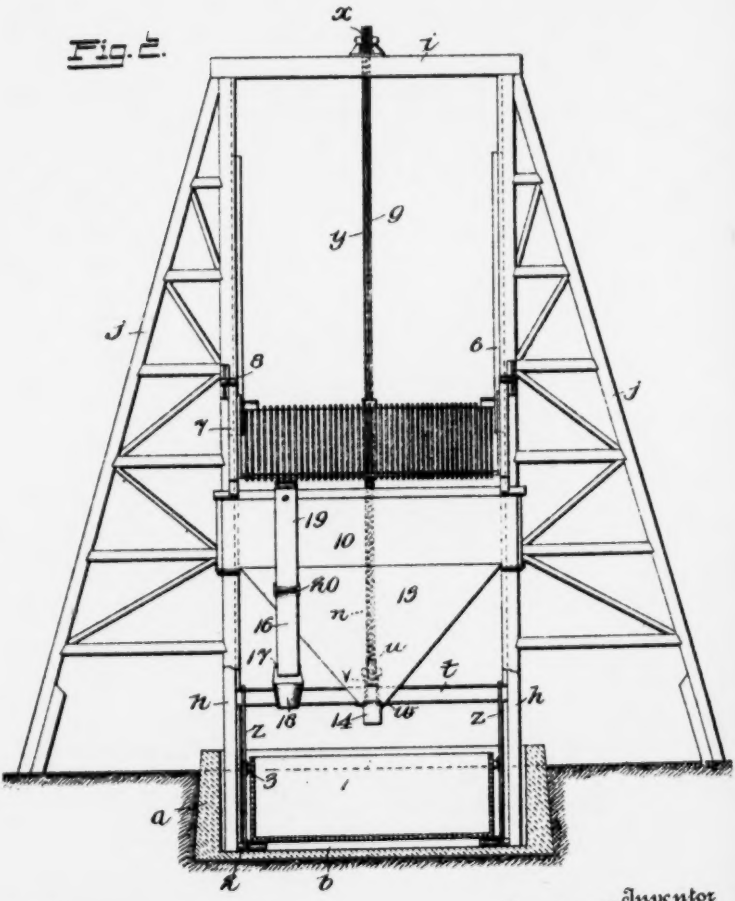
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APPARATUS FOR HANDLING BEETS.

APPLICATION FILED APR. 22, 1907.

2 SHEETS—SHEET 2.

Fig. 2.



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COPY BOUND CLOS

UNITED STATES PATENT OFFICE.

DETLEF L. JOEHNCK, OF ROCKY FORD, COLORADO.

APPARATUS FOR HANDLING BEETS.

No. 875,529. Specification of Letters Patent. Patented Dec. 31, 1907.

Application filed April 22, 1907. Serial No. 369,819.

To all whom it may concern:

Be it known that I, DETLEF L. JOEHNCK, a citizen of the United States, residing at Rocky Ford, county of Otero, State of Colorado, have invented certain new and useful Improvements in Apparatus for Handling Beets; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in loading apparatus.

In the following specification, for the purpose of brevity and clearness, reference is simply made to "beets" as the product to be handled, but it will of course be understood that instead of beets other products may be equally well handled, such for instance as other classes of tubers, corn, grain, coke, coal, stone, etc., and the employment of the word "beets" is not to be construed as restricting the invention to this particular use.

The invention is especially designed for the purpose of storing in large quantities, by directly conveying to the storage chamber such as a railroad car, wagon loads of the product, such as beets, which at the same time are screened from dirt and refuse matter, and a sample of each wagon load being procured while the articles are being transported from the wagon or similar vehicle to the railroad car, or other storing compartment.

While I do not limit myself to the exact details herein referred to, still for the purpose of disclosure reference is had to the accompanying drawings illustrating a practical embodiment of the invention, in which like letters designate the same parts in the several views, and in which:—

Figure 1 is a side elevation of my apparatus, the lower portion of the main upright frame being broken away and the bed of the pit being shown in section for the purpose of clearness in illustration. Fig. 2 is a front elevation of the apparatus, the lower portion of the main frame being broken away and the pit and the skip car being shown in transverse section, and Fig. 3 is a fragmentary local view on an enlarged scale showing the pit and skip car in vertical section, and a slightly modified form of dumping wagon.

In carrying out the invention broadly, I employ a platform scale, located adjacent a pit, and coöperating with a suitable upright support, a skip car therefor, hoisting means for the skip car, means for tripping the skip car at a predetermined position of elevation, means for screening the beets from the refuse matter and conveying the cleaned beets to the car or other storage compartment, and means for obtaining samples of each wagon load of beets, the whole coöperating to form an efficient apparatus for practically carrying out in a continuous operation the weighing of the load of beets, the conveying of same in a clean state to the car, and the obtaining of a sample of each wagon load.

a designates a pit for the reception of the skip car, which may be provided with the recessed center *b*, to receive the depending means for pivoting the skip car to the hoisting apparatus; *c* designates a base chamber for the reception of the platform *d* of the scales *e* located in a suitable shed *f*, containing drums operated by any suitable power, and designated by an engine conventionally, as at *g*. The pit *a* and compartment *c* may be of lumber, or cement or other masonry work, as shown.

Disposed above the pit *a* is located an upright support, which may be stayed in any suitable manner. In the drawings, this upright support consists of a vertical frame comprising the side members *h*, the top crosspiece *i*, the whole stayed by the laterally-extending truss frames *j* and the rearwardly-extending trussing frames *k*; each of said trussing frames consisting of the inclining main timbers and the cross bars *l*.

On one of the cross bars *l* may be suitably mounted a roller or sheave *m*, disposed above the platform of the scales, over which reeves a cable *n*, connected at one end to an operating drum of the engine *g* or other operating power and at its other end provided with a swivel and hook connection *o*, adapted to be secured to a tilting wagon body *p* as, for instance, by means of an eye *q*. The vehicle for conveying the beets to the scales, as shown in Fig. 1, simply consists of the wagon body *p*, detachably mounted on a suitable running gear *r*. The uprights or standards *h* of the vertical frame are preferably composed of channeled iron to form a guideway *s* for the reception of the ends of the vertically-slidable I-beam *t*, carrying at its center a pulley *u* preferably of the compound type, mounted in any suitable way, but shown in the drawings as carried by the side bars *v* passed through the I-beam and bent beneath

and secured to the lower web thereof, as shown at *w*. *x* designates a pulley preferably of the compound type, suitably mounted on the top cross-piece *i*, and *y* designates a cable secured in any suitable way at one end and associated with said compound pulleys and passing as at *y'*, to a drum operated by the engine or other power.

Suspended by the I-beam *t*, by means of the hanger straps *z*, is the skip car 1, consisting of a tilting bucket provided with base bearings, having trunnion pins 2, around which pass the hanger straps *z*. Rigidly mounted between the straps *z*, at a suitable position thereon, is a pair of spacing blocks 3, each carrying a pivoted latch 4, on opposite sides of the skip car, which pivoted latches 4 are adapted to engage with lugs 5 on the skip car. Disposed above said pit, and in alinement with the rear end of the latches 4 are a pair of trip bars 6, which obviously may be adjustably or rigidly connected with the framework. At a position on said upright frame, slightly above the bottom of said trip bars 6, is pivotally mounted a grizzly screen 7, which is shown as hinged to the upright frame, as at 8. The outer end of this grizzly screen is suspended by means of a cable or cables 9, reeving over pulleys on the cross bar *i* (not shown) in passing to the operating drums, 10 designating the front wall of an open hopper supporting the outer edge of the grizzly screen and pivoted as at 11 to a suitable support on the upright frame. This front wall 10 of the hopper cooperates with the rear wall 12 to deflect any screenings to a chute 13 communicating by means of a spout 14 with a wheelbarrow, or other means for conveying off refuse matter. The front wall of the hopper 10 is also connected with the grizzly screen 7 by means of a flexible connection 15, secured at one end to said front wall, thence reeving around a pulley mounted on said rear wall 12 of the hopper, and secured at its other end to the rear or hinged end of the grizzly screen.

Disposed at the lower or discharge end of the screen is mounted a sampler tube, preferably of sectional construction. This sampler tube is designed to be disposed in any position along the lower edge or discharge end of the screen. In the drawings, the lower section 16 of the sampler tube is shown as carried by the framework construction, and at its lower end is provided with a bracket 17 for suspending a receptacle 18 for the sample beets. The upper section 19 of the tube is shown as mounted on the pivoted front wall 10 of the hopper, a joinder with the lower section being made as at 20. The upper end of the section 19 is provided with a baffling plate 20 which may be adjustably connected to the tube in any suitable way, designated conventionally as by a locking screw 22. The construction shown in Fig. 3 is the same as that shown in the other figures, but instead of the tilting wagon body *p*, the same is provided with a rope net 23 for discharging the load of beets into the skip bucket 1.

In operation, referring to Figs. 1 and 2, a wagon load of beets is driven onto the scales, and after weighing same, the cable *n* is operated to tilt the wagon body and dump the beets into the skip bucket, after which the cable *y* is operated to elevate the skip bucket, and as soon as the latch 4 engages the lower end of the trip bar 6, the skip bucket is released, the latch being held in its elevated position, shown in dotted lines in Fig. 1, by sliding along the trip bar, and ready to engage the bucket and lock same in position upon its descent. At the same time when the latch is tripped, the forward end of the bucket is in a position just above the rear end of the screen, and consequently the rear end of the screen acts as a fulcrum for the forward end of the bucket which is gradually tilted over until it assumes the position shown in dotted lines. The beets being dumped onto the screen, the dirt, stone, and other refuse matter passes through the coarse screen, down through the hopper, and out of the chute 14 into a wheel barrow or other form of vehicle, while the discharged beets pass into the car or other storing chamber disposed at the end of the screen. During the passage of the beets past the sampler tube, however, some of the beets striking the baffling plate 21 will fall down through the sampler tube into the bucket 18, thereby furnish a sample of the load of beets being dumped.

The wagon with the load of beets having been initially weighed, and having also been weighed after dumping the load into the skip bucket, the true weight of the beets is ascertained by then weighing the refuse matter discharged through the tube 14, and subtracting the weight of this refuse matter plus the weight of the wagon from the gross weight of wagon and beets.

Having thus described the invention, what I claim is:—

1. The combination of an upright support, a skip car vertically movable thereon, an inclining screen projecting therefrom, a hopper disposed beneath said screen, a sampling chute disposed at the outer end of said screen, means for hoisting said skip car, and means tilting said skip car adjacent said screen for discharging the contents thereon, substantially as described.

2. The combination of an upright support, an inclining screen projecting therefrom, a movable support carried by said upright and means for hoisting said support, a skip car pivotally suspended by said movable support, a latch pivotally mounted on said movable support adapted to engage locking means on

said skip car, and means for tilting said skip car during its upward movement for discharging the contents thereof on said screen, comprising a tripping bar engaging the tail end of said latch, substantially as described.

3. The combination of an upright frame, an inclined screen carried thereby, a cross beam carried by said frame and mounted to slide therein, a skip car having a trunnion pin on each side thereof, a pair of hanger straps passing around said cross bar and said trunnion pins, a spacing block secured to one of said straps, a latch pivoted to said spacing block and cooperating with a lug on said skip car, means for elevating said cross bar, and means for tripping said latch comprising a trip bar projecting in the path of said latch below said inclining screen, substantially as described.

4. The combination of an upright support, a skip car movable vertically thereon and means for elevating same, a screen pivotally secured to said frame, a cable supporting the end of said screen, means for operating said cable, and means for tilting said skip car to dump the contents thereof on said screen, substantially as described.

5. The combination of an upright support, a pivoted screen carried thereby, a hopper disposed below said screen comprising a stationary rear wall and a pivoted front wall, the front wall of said hopper adapted to engage and support the outer end of said screen, a fixed pulley carried by said frame, a cable suspending the outer end of said screen and means for operating same, flexible means reeving around said fixed pulley and disposed between the upper end of said pivoted front wall and the rear end of said screen, a skip car vertically movable on said support, means for elevating said skip car, and means for tripping said skip car to tilt the contents thereof on said screen, substantially as described.

6. The combination of an upright support, an inclining screen projecting therefrom, a sampling tube disposed at the lower end of said inclining screen, a skip car carried by said frame, and means for elevating said skip car and tilting the contents thereof on said screen, substantially as described.

7. The combination of an upright support, an inclining screen projecting therefrom, a sampling tube disposed at the lower end of said inclining screen, a baffling plate projecting above said sampling tube, a skip car carried by said frame, and means for elevating said skip car and tilting the contents thereof on said screen, substantially as described.

8. The combination of an upright support, an inclining screen projecting therefrom, a sampling tube disposed at the lower end of said inclining screen, an adjustable baffling plate projecting above said sampling tube, a skip car carried by said frame, and means for elevating said skip car and tilting the contents thereof on said screen, substantially as described.

9. The combination of an upright support, a pivoted screen, a hopper disposed below said screen comprising a stationary rear wall and a pivoted front wall supporting the forward end of said screen, flexible means connecting said screen and pivoted front wall, a cable connected to said screen and means for operating said cable to elevate said screen, a sectional sampling tube the upper section carried by said pivoted front wall and the lower section being supported in a stationary position, a receptacle for catching the sample beets, a skip car vertically movable on said upright support, means for elevating said skip car, means for tripping same to tilt the contents thereof on said screen, and means for delivering a load of beets to said trip car, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

DETLEF L. JOEHNCK.

Witnesses:
R. W. GIBBONS,
H. D. MACON.

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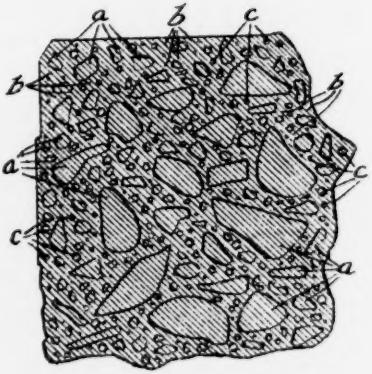
A. D. NEY.

ROCK LIKE SUBSTANCE.

APPLICATION FILED JULY 10, 1909.

939,072.

Patented Nov. 2, 1909.



Witnesses:
F. P. Bond
Elmaine Banning.

Inventor:
Alexander D. Ney
by Banning & Banning
Attys

847

503

UNITED STATES PATENT OFFICE.

ALEXANDER D. NEY, OF AURORA, ILLINOIS.

ROCK-LIKE SUBSTANCE.

939,072. Specification of Letters Patent. Patented Nov. 2, 1909.

Application filed July 10, 1909. Serial No. 506,980.

To all whom it may concern:

Be it known that I, ALEXANDER D. NEY, a citizen of the United States, residing at Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Rock-Like Substances, of which the following is a specification.

The object of the present invention is to produce a relatively hard, compact, and solid rock-like substance, composed, in part, of earthy materials, such as stones, pieces of rock, slag, pieces of brick, or similar natural or artificial mineral products, and, in part, of cement, which serves to unite the earthy materials into a solid mass.

In the making of concrete, it has hitherto been the general practice, in mixing the materials, to make the mass as stiff as possible, using only sufficient water to cause adherence of the materials together, and thereafter tamping the materials to cause the mass to be as compact as possible in its relatively dry condition.

In the operation of making the product of the present invention, a radically different method is followed in that an abundance of water is employed in order not only to permit gravity to bring the mass to a solid, compact condition, and thereby dispense with the ramming operation, but also to provide sufficient water for the purposes of crystallization. The process of forming the present product is essentially a wet process as distinguished from the relatively dry process employed in making concrete.

The drawing shows a piece of the present product, broken through the mass to illustrate the various ingredients employed and the character of the completed mass.

In carrying out the present process I employ particles *a* of stone, slag or other earthy material, which should be cleansed from vegetable substances, dirt or filth and are preferably graduated is size from the largest particles the work will permit, down to particles which are substantially the sizes of the particles of cement. These particles of earthy material should be used in a moist condition, since such particles will absorb a greater or less amount of water; and it is highly desirable that the water absorbed into the particles of earthy material be not withdrawn from the water stored up in the cement, and which is necessary for purposes of crystallization. The stone, slag or other earthy material should preferably be used in sufficient quantity to form the bulk of the mass, so that the cement will serve to unite the seams, but need not be used as a filler for large spaces or cavities, which would be an expensive way of combining the materials composing the mass. Furthermore, it is desirable to use a minimum quantity of cement in order to conserve the available quantity of water for purposes of crystallization. A sufficient amount of cement *b* should be used to thoroughly cement the seamage of the mass, the earthy particles being relied upon to give the necessary bulk to the mass. A sufficient quantity of water should be used in the mixture to cause it to liquidate sufficiently to allow gravity to bring the material to a solid mass, having within its body and stored in cells or cavities a reserve supply of water which will be drawn upon to assist in the crystallization of the materials. When the above mass of materials is thoroughly mixed, it should be stirred in a mixing manner within the form, to cause the material to thoroughly fill the form and take on the shape of the form.

During the mixing operation, the cement will be evenly and thoroughly spread over the surface of the stone, slag or other earthy particles of material, so that the cement will be in position to unite in a satisfactory manner with all the exposed surface of the particles of earthy material. If a sufficient quantity of water has been used in the mixing of the materials, a layer of water will be present on the surface of the materials after the mixing operation, and the mixing should be continued in the form so long as any air bubbles appear on the surface of the water, which air bubbles indicate the presence of air voids in the body of the mass of fresh material, which should be eliminated before the initial crystallization of the mass. During the progress of crystallization, the layer of water on the top of the mass will gradually disappear, uniting with the cement in the crystallizing action.

After the mass has normally crystallized, which takes place during about thirty days or more, it will, when broken, cleave through the particles of rock or other earthy material, indicating that the entire mass is of substantially equal strength, where stone, slag or other similar earthy material of ordinary strength is used. An inspection of the broken surface will show that the particles of earthy material are entirely and com-

pletely embedded in and surrounded by the cement, so that practically no air holes or interstices will be present, save only that the mass will be interspersed with small cells or cavities *c* having a smooth rounded surface, which cells or cavities indicate the spaces from which water has been drawn by crystallization.

The product of the present invention differs from certain prior products, by reason of the presence of such cells or cavities, which would be lacking if the mass were subjected to a pressure tending to expel the water prior to the crystallization. The water being lighter than the other bodies of materials used in the mass, a pressure caused by tamping or ramming would bring the water to the top of the material and destroy the uniform position of the cells in which the reserve supply of water is held. The product of the present invention is superior to ordinary tamped concrete, in strength, uniformity, hardness and durability, and more impervious to the penetration of water. Furthermore, by dispensing with the tamping or ramming process, the present product can be produced more quickly and easily, and will more perfectly shape itself to the intended form.

The product of the present invention is especially adapted for use in forming the lower or ground layer of sidewalks, and for general construction.

I claim:

1. A rock-like substance, composed, in part, of particles of earthy material, and having the seams intermediate such particles filled with crystallized cement, the mass having therein cells or cavities formed by the withdrawal of water by crystallization, substantially as described.

2. A rock-like substance, composed, in part, of particles of earthy material of graduated sizes, and having the seams intermediate such particles filled with crystallized cement, the mass having therein cells or cavities formed by the withdrawal of water by crystallization, substantially as described.

3. A rock-like substance, composed, in part, of particles of earthy material of graduated sizes, proportionate from the largest particle the work will permit down to the size of the particles of cement used, and having the seams intermediate such particles filled with crystallized cement, the mass having therein cells or cavities formed by the withdrawal of water by crystallization, substantially as described.

4. A rock-like substance, composed, in part, of particles of earthy material, completely coated with crystallized cement to unite the seamage between the particles, and the mass having therein cells or cavities formed by the withdrawal of water by crystallization, substantially as described.

5. A rock-like substance, composed, in part, of particles of earthy material of graduated sizes, completely coated with crystallized cement to unite the seamage between the particles, and the mass having therein cells or cavities formed by the withdrawal of water by crystallization, substantially as described.

6. A rock-like substance, composed, in part, of particles of earthy material of graduated sizes, proportionate from the largest particle the work will permit down to the size of the particles of the cement used, completely coated with crystallized cement to unite the seamage between the particles, and the mass having therein cells or cavities formed by the withdrawal of water by crystallization, substantially as described.

7. A rock-like substance, composed, in part, of particles of earthy material, completely coated with crystallized cement to unite the seamage between the particles, and the mass having the air voids eliminated by stirring in a mixing manner, and having therein cells or cavities formed by the withdrawal of water by crystallization, substantially as described.

ALEXANDER D. NEY.

Witnesses:
FRANCES M. FROST,
SAMUEL W. BANNING.

859

506

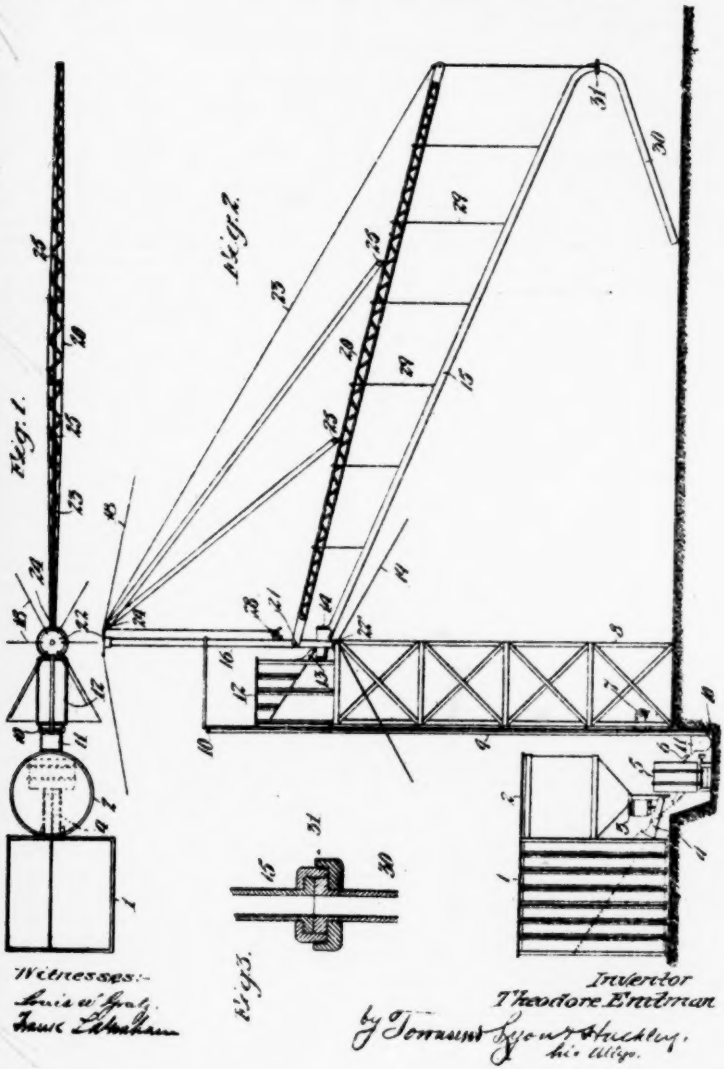
T. EMTMAN.

PLANT FOR CONCRETE CONSTRUCTION.

APPLICATION FILED FEB. 17, 1909.

948,723.

Patented Feb. 8, 1910.



Witnesses:-
Louis W. Gratz
Isaac Lehmann

Inventor
Theodore Emtman
by Townsend Lyon & Stockley,
his Attys.

850

507

UNITED STATES PATENT OFFICE.

THEODORE EMTMAN, OF LOS ANGELES, CALIFORNIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CONCRETE APPLIANCES COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

PLANT FOR CONCRETE CONSTRUCTION.

948,723. Specification of Letters Patent. Patented Feb. 8, 1910.

Application filed February 17, 1909. Serial No. 478,320.

To all whom it may concern:

Be it known that I, THEODORE EMTMAN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Plant for Concrete Construction, of which the following is a specification.

The object of the present invention is to provide an economical and practical plant for the construction of cement buildings or structures, and it is particularly adapted to the construction of large structures where economy in transportation and pouring of the cement is an important factor in the cost.

The main object of the present invention is to provide a plant whereby the cement can be economically and rapidly delivered to any part of the work or structure.

Another object of the invention is to provide a complete apparatus for performing the entire operation of preparing and delivering the cement or concrete.

Other objects of the invention will appear hereinafter.

The accompanying drawings illustrate my invention.

Figure 1 is a plan of the plant. Fig. 2 is a side elevation thereof. Fig. 3 is a section of the swivel for the delivery pipe.

The plant comprises a preparing apparatus and a delivery apparatus arranged to take the cement or concrete from the mixing apparatus and to deliver it to any desired location over a more or less extended range.

The mixing apparatus comprises a bin 1 for containing sand, gravel, etc., a bin 2 for containing the cement, and a tank 3 for water, a measuring receptacle 4 being provided to take definite portions of sand and gravel from the bin 1 and deliver such portions to the rotary mixer 5, bins 1 and 2 and tank 3 being adapted to deliver the sand or gravel, cement and water to the rotary mixer 5 by gravity. Rotary mixer 5 is of any suitable construction, such as is well known in the art and is provided with an outlet or delivery chute or means 6.

The delivery apparatus comprises an elevator for lifting the concrete to a suitable height to enable it to run to any part of the range of the apparatus by gravity, and a chute taking such concrete from the elevator and delivering it by gravity to the point desired. A tower or frame 8, which may be built in stages, as shown, so as to enable it to be made of any required height, supports the elevator 9 which may consist of an endless cable or carrier mounted on pulleys 10, carrying a bucket 11, which, in the vertical movement of the carrier, is adapted to pass under the mouth of the delivery chute 6 of the rotary mixer 5, the bucket 11 being then in its lowest position. A hoist or other means 7 is provided for operating the elevator 9. A bin or hopper 12 is provided at the top of the tower 8 in position to receive the contents of the bucket 11 when the latter is carried by the elevator carrier 9 to the top of the hopper 12 and dumped. Said hopper 12 has a delivery chute 13, extending over an open-topped receptacle or mouth 14 at the upper end of the delivery chute 15. Said delivery chute is mounted on a vertical mast 16 to turn horizontally, said mast being supported on the tower 8 and being guided if necessary by lateral guy ropes 18. Guy ropes 19 may also be provided to brace the lower end of the mast 16. A boom or derrick member 20 is pivoted at 21 to said mast 16 so as to turn thereon in a vertical plane and is supported in a proper position by means of a cable 23 passing over pulleys 24, 25, respectively, on the cap-plate 22 at the top of the mast and on the boom said cable forming an extensible connection. The under end of this cable passes to a winch 26 whereby the boom 20 may be raised or lowered as required. Chute 15 is suspended from boom 20 by any suitable means, for example, by suspension rods 29. To the lower end of the chute 15 is connected a delivery pipe 30 having a swivel connection 31 with the chute or pipe 15 so that the pipe 30 can be swung around on a horizontal plane. The delivery apparatus is capable of the following movements to enable it to cover an extended vertical and horizontal range. In a horizontal plane the means 16 together with the boom and the delivery means 30 carried thereby may be turned in a horizontal plane by the rotation of the mast in the cap plate 22 and the step-bearing 22′ at the bottom thereof. The pipe 30 may be swung in a horizontal plane by turning on its swivel 31 so as to distribute the cement in a particular part of the work or construction,

within a radius equal to the projection of the delivery pipe when fully extended.

The plant is operated as follows:—Sand or gravel from bin 1, cement from bin 2, and water from tank 3 are charged intermittently by means of device 4 to the rotary mixer 5, by the operation of which these ingredients are mixed to form the concrete. The bucket 11 of the elevator is brought repeatedly to lowermost position to receive the mixed concrete and the concrete having been dumped thereinto the bucket is raised by the elevator to the top of the tower and its contents are discharged into the bin 12, whence such contents pass by gravity into the chute 15 and down said chute and through the delivery pipe 30 to the outlet of said pipe. By turning said pipe 30 in its swivel 31, the cement is distributed over the part of the work that is being operated upon for the time being. When it is desired to shift the operation from one part of the structure to another the chute 15 can be swung on the mast 16 as a center. As the construction progresses the chute 15 may be raised by means of the devices 23, etc. to keep pace with the elevation of the structure, the upper end of chute 15 fitting sufficiently loose on the mast 16 to permit of this movement, and the enlarged mouth at the upper end of the chute maintaining its proper relation for receiving concrete from the bin 12.

What I claim is:—

1. A plant for concrete construction comprising an elevator provided with means for receiving and raising concrete, a chute adapted to receive the concrete raised by the elevator and to deliver the same by gravity, a mast mounted to rotate on a vertical axis, a chute pivoted to said mast and extending therefrom at an inclination to feed the concrete by gravity, and a boom supporting said chute and having extensible connection with the mast to vary its vertical position.

2. A plant for concrete construction comprising an elevator provided with means for receiving and raising concrete, a chute adapted to receive the concrete raised by the elevator and to deliver the same by gravity, a mast mounted to rotate on a vertical axis, a chute pivoted to said mast and extending therefrom at an inclination to feed the concrete by gravity, a boom supporting said chute and having extensible connection with the mast to vary its vertical position, and a delivery pipe swiveled to the lower end of said chute to turn it to different angular positions.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 6th day of February 1909.

THEODORE EMTMAN.

In presence of—
G. T. Hackley,
Frank L. A. Graham.

852

510-511

T. F. LONNEY.

EXCAVATING MACHINE.

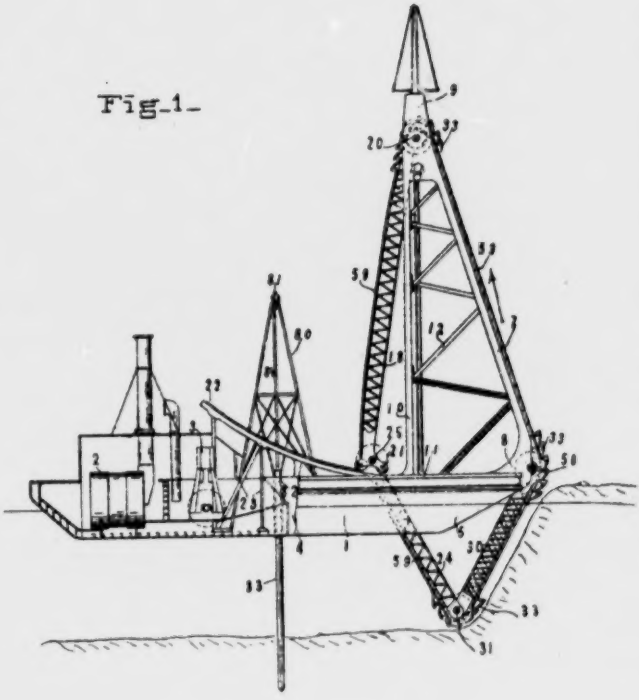
APPLICATION FILED NOV. 10, 1906. RENEWED JUNE 29, 1910.

969,172.

Patented Sept. 6, 1910.

11 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

Arthur Perry.

R. F. Martin

INVENTOR

T. F. Lonney

BY

Duell, Warfield & Duell

ATTORNEYS

853

T. F. LONNEY. 512-513

EXCAVATING MACHINE.

APPLICATION FILED NOV. 10, 1908. RENEWED JUNE 29, 1910.

969,172. Patented Sept. 6, 1910.

11 SHEETS—SHEET 2.

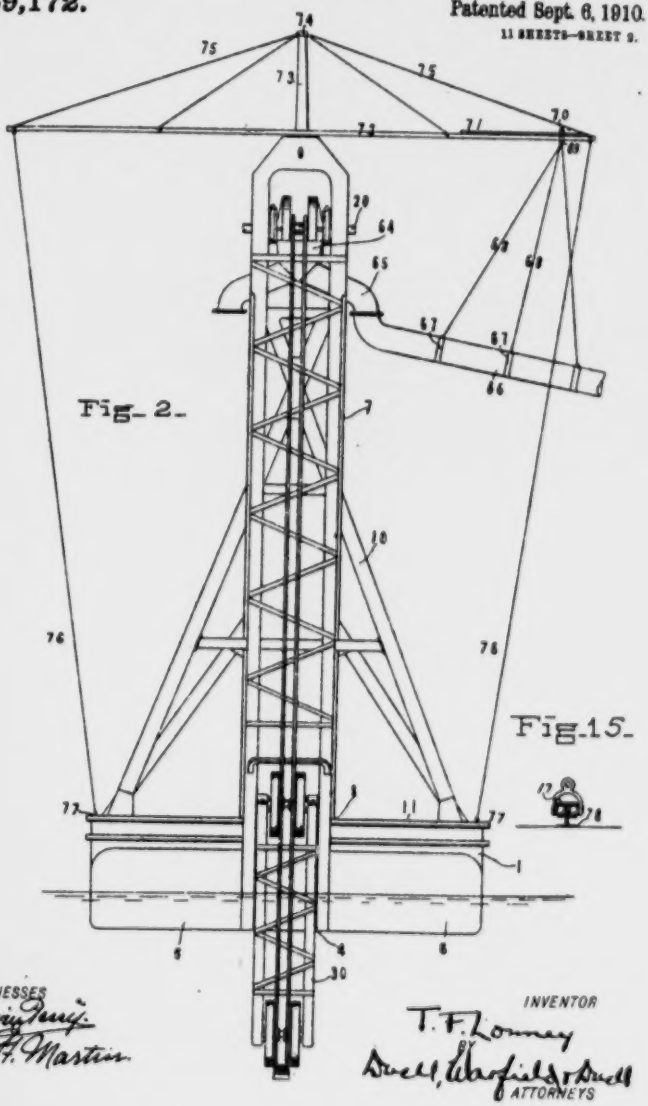


Fig. 2.

Fig. 15.

WITNESSES

Louis Penney

R. F. Martin

INVENTOR

T. F. Lonney

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ATTORNEYS

854

514-515

T. F. LONNEY.

EXCAVATING MACHINE.

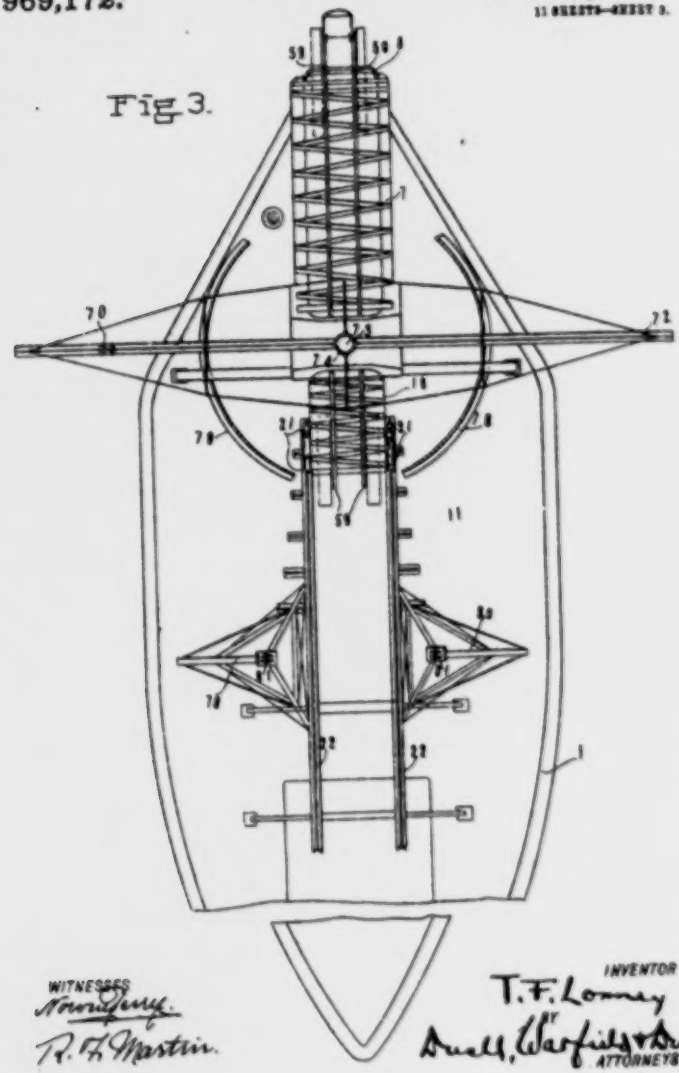
APPLICATION FILED NOV. 10, 1909. RENEWED JUNE 20, 1910.

969,172.

Patented Sept. 6, 1910.

11 SHEETS—SHEET 3.

Fig 3.



WITNESSES

INVENTOR

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855

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516-517

EXCAVATING MACHINE.

APPLICATION FILED NOV. 10, 1909. RENEWED JUNE 29, 1910.

969,172.

Patented Sept. 6, 1910.

11 SHEETS—SHEET 4.

Fig. 4.

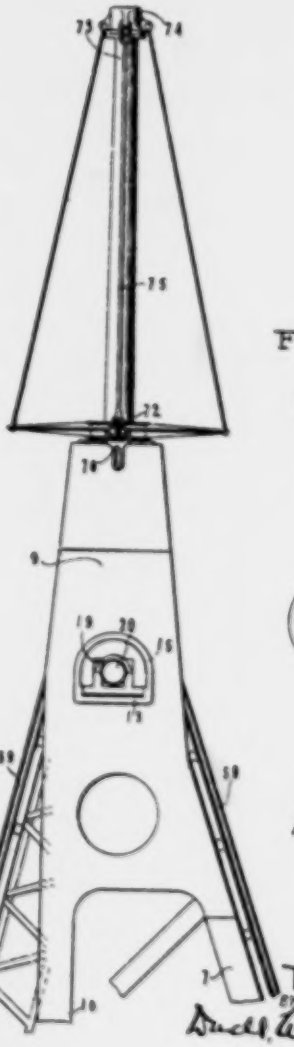


Fig. 16.



WITNESSES

INVENTOR

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856

518-519

T. F. LONNEY.

EXCAVATING MACHINE.

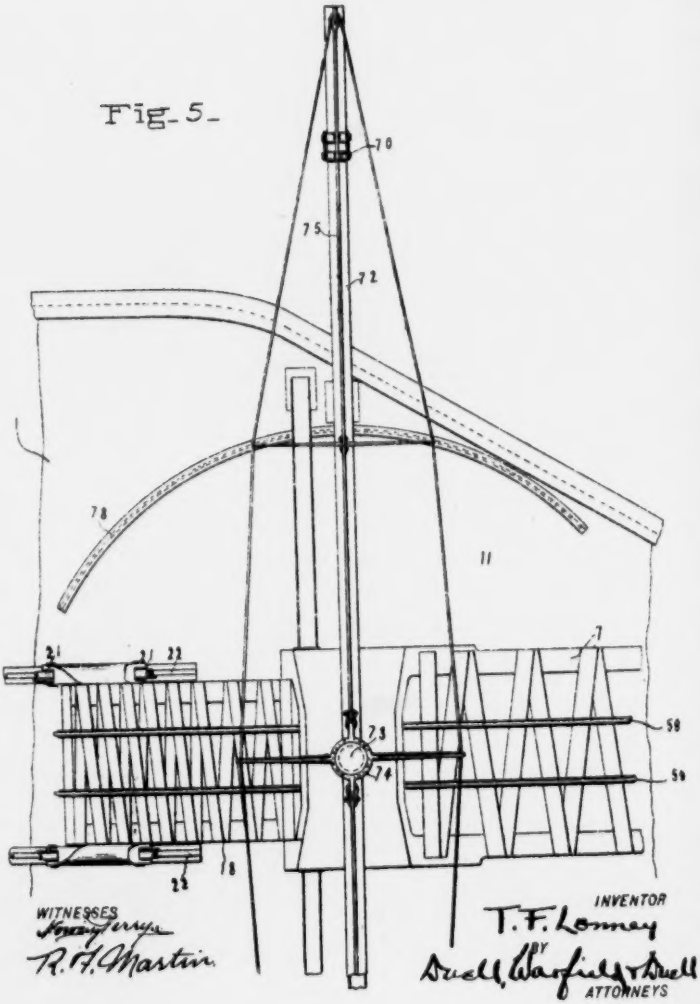
APPLICATION FILED NOV. 10, 1906. RENEWED JUNE 20, 1910.

969,172.

Patented Sept. 6, 1910.

11 SHEETS—SHEET 5.

Fig. 5.



WITNESSES

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520–521

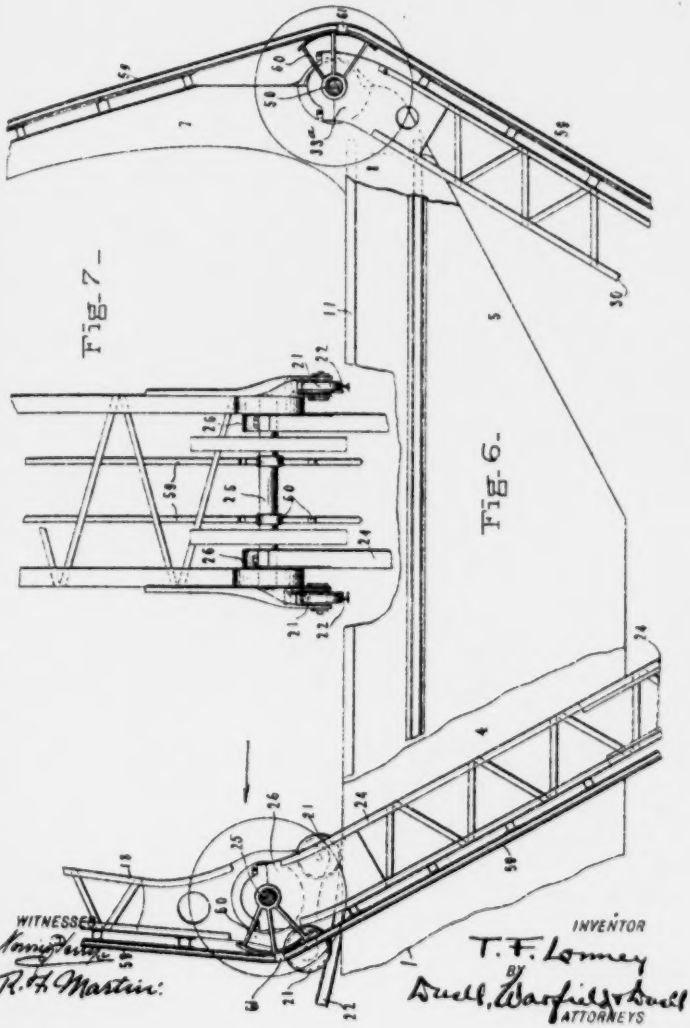
EXCAVATING MACHINE.

APPLICATION FILED NOV. 10, 1906. RENEWED SEPT. 29, 1910.

969,172.

Patented Sept. 6, 1910.

11 SHEETS—SHEET 6.



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522-523

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EXCAVATING MACHINE.

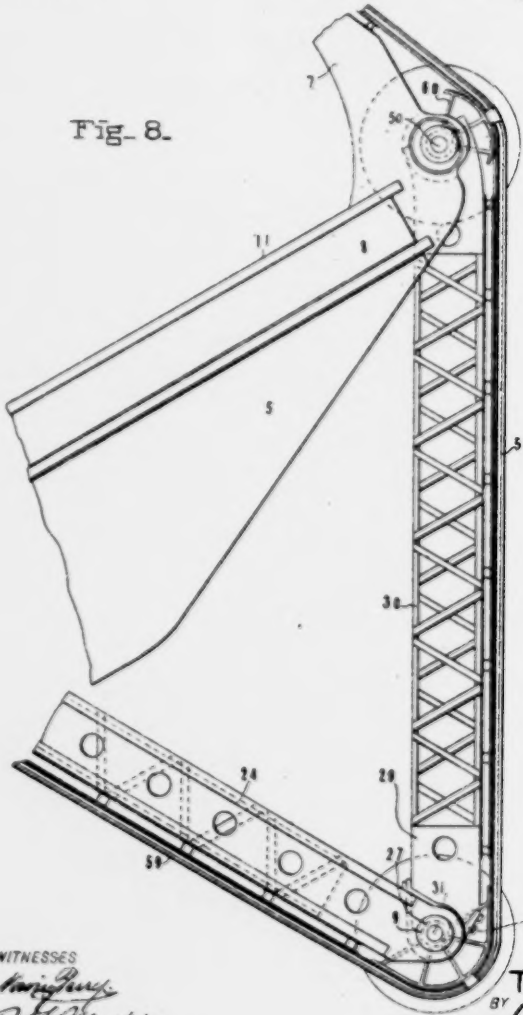
APPLICATION FILED NOV. 10, 1908. RENEWED JUNE 29, 1910.

969,172.

Patented Sept. 6, 1910.

11 SHEETS—SHEET 7.

Fig. 8.



WITNESSES

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524-525

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EXCAVATING MACHINE.

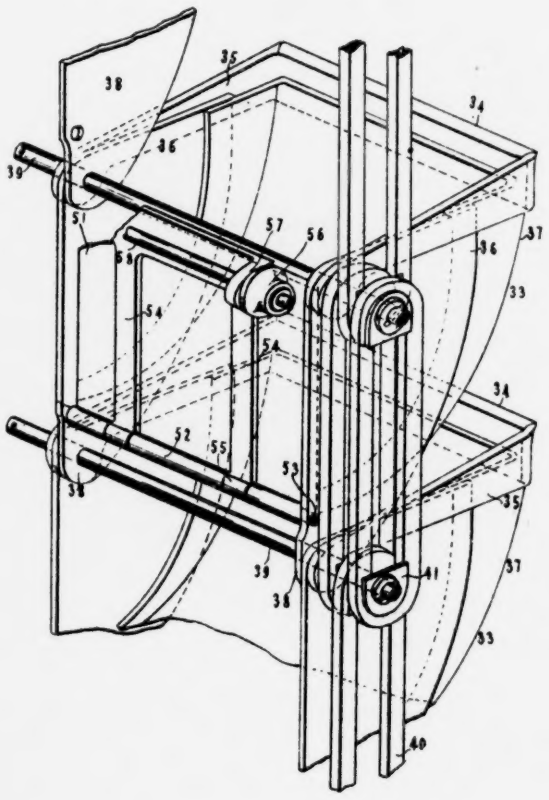
APPLICATION FILED NOV. 10, 1906. RENEWED JUNE 20, 1910.

969,172.

Patented Sept. 6, 1910.

11 SHEETS—SHEET 8.

Fig. 9.



WITNESSES

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526-527

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EXCAVATING MACHINE.

APPLICATION FILED NOV. 10, 1906. RENEWED JUNE 29, 1910.

969,172.

Patented Sept. 6, 1910.

11 SHEETS—SHEET 9.

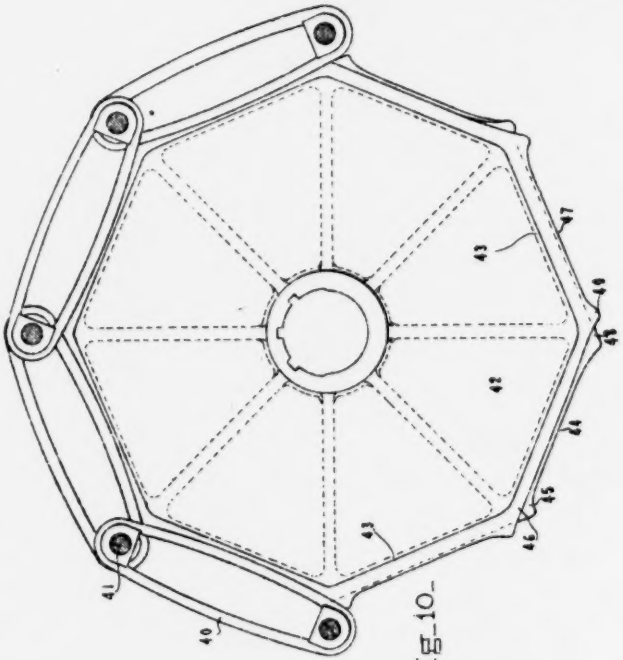


Fig. 10.

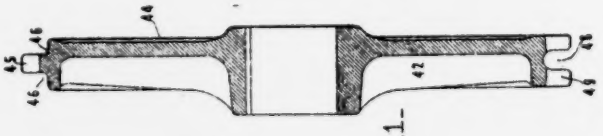


Fig. 11.

WITNESSES

Sowing Gang.

R. H. Masten.

INVENTOR

T. F. Lonney

BY

Duell, Warfield & Duell,

ATTORNEYS

861

T. F. LONNEY.

528-529

EXCAVATING MACHINE.

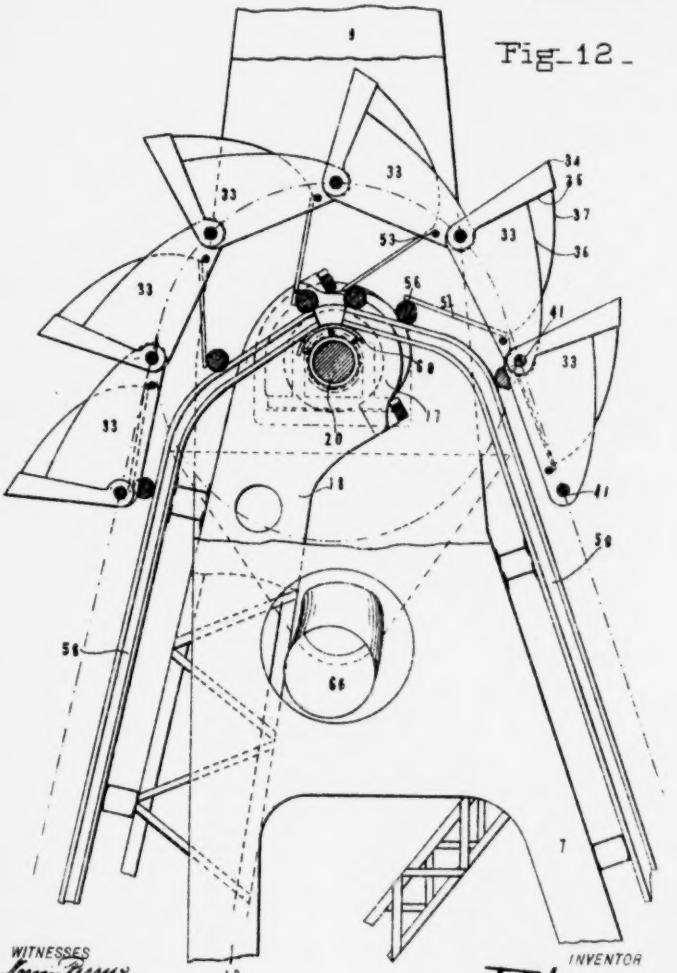
APPLICATION FILED NOV. 10, 1906. RENEWED JUNE 29, 1910.

969,172.

Patented Sept. 6, 1910.

11 SHEETS—SHEET 10.

Fig. 12.



WITNESSES

R. H. Martin.

INVENTOR

T. F. Lonney

BY

Duell, Warfield & Duell

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802

530

T. F. LONNEY.

EXCAVATING MACHINE.

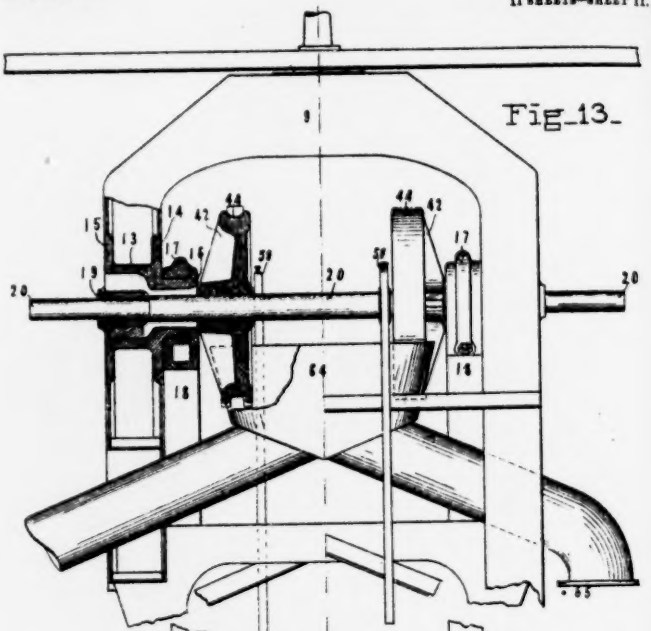
APPLICATION FILED NOV. 10, 1906. RENEWED JUNE 29, 1910.

969,172.

Patented Sept. 6, 1910.

11 SHEETS—SHEET 11.

Fig. 13.



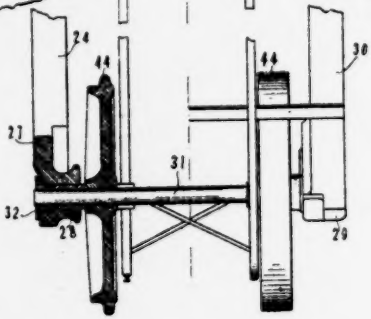


Fig. 14.

WITNESSES:

Nowitzky

R. F. Martin

INVENTOR

T. F. Lonney

BY

Duell, Warfield & Duell

ATTORNEYS

UNITED STATES PATENT OFFICE. 531

THOMAS F. LONNEY, OF BROOKLYN, NEW YORK, ASSIGNOR TO GEORGE UPINGTON, OF BROOKLYN, NEW YORK.

EXCAVATING-MACHINE.

969,172. Specification of Letters Patent. Patented Sept. 6, 1910.

Application filed November 10, 1906, Serial No. 342,782. Renewed June 29, 1910. Serial No. 569,581.

To all whom it may concern:

Be it known that I, THOMAS F. LONNEY, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Excavating-Machines, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention broadly relates to means for excavating material, but since certain of its characteristic advantages prominently appear when it is resorted to for the purpose of enlarging or constructing new waterways, it will be conducive to clearness to describe an embodiment especially adapted for such use.

One object of this invention is to provide a means of the class described which will excavate material in advance of the excavating apparatus, so that the latter may continuously advance and cut its own channel.

Another object is to provide an excavating apparatus which operates by means of an endless chain of buckets and in which the slope of the cutting line may be arranged to conform to various positions without necessitating a variance in the length of the endless chain of buckets.

Another object is to devise an excavating apparatus in which the cutting may take place along a runway rising to the beak of the boat, and in which such runway may be given any desired slant, so that the buckets may gather material continuously throughout their length of travel along such runway, and so that the material may be gathered from the superficial submerged surface of the bank and therefore be of a relatively soft nature.

Another object of this invention is to devise an apparatus of the class described which will gather the material to be excavated in such a way that it will be loosely retained in the scoop and thus be in a condition admitting of a ready discharge from the buckets without imposing undue shock or strain upon the apparatus.

Another object is to provide an excavating device of the described nature with means whereby it may be maintained in a given position and be capable of being swung about a center post to cut channels of various widths.

Another object is to devise an excavator which provides means for progressively advancing the whole against the bank, simultaneously with a side to side oscillation of the cutting line.

Another object is to provide an excavator which from an operative standpoint will, in usage, possess a high degree of efficiency and effectiveness, and which, structurally considered, will be of the greatest possible simplicity, being composed of but few parts, all adapted for being made at a minimum of cost and individually so formed as to be capable of being readily assembled into a compact and highly mechanical arrangement for accomplishing the purposes intended.

Other objects and advantages will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

In order that this invention may be more fully understood and made comprehensible to others skilled in its relating arts, drawings illustrating a practical manner of carrying out the same are appended as a part of this specification, and, while the controlling principles of the invention may be otherwise applied by modifications falling within the scope of the claims, the herein disclosed embodiment is that which will ordinarily be preferred in practice and is regarded as representing substantial improvements over the many obvious and implied variations of the same.

In such drawings like numerals refer to corresponding parts throughout all the figures, of which—

Figure 1 is a side elevation showing the excavator in operation, a side of the boat being cut away to give a diagrammatic representation of the mounting of the engine and boilers relatively to the collapsible excavating framework and also showing a steady pile anchored to the bottom of the waterway; Fig. 2 is an end elevation looking toward the front of the apparatus and illustrating certain details not apparent from the preceding figure; Fig. 3 is a top plan

view showing the general arrangement of the parts of this apparatus and their mountings upon the float or vehicle supporting the same; Fig. 4 is a fragmentary elevation on an enlarged scale to show in detail the top brace or crane which serves to position and carry the discharge chute, together with the various features incidental to the same; Fig. 5 is an enlarged fragmentary view in elevation, showing the apex of the excavating framework and the mounting of the top brace or crane carried at the summit thereof; Fig. 6 is an enlarged elevation showing details of the intermediate joints and the arrangement of the corresponding parts of the runway; Fig. 7 is an elevation of the movable intermediate joint looking at the same from the inside, *i. e.*, in the direction of the arrow shown on Fig. 6; Fig. 8 is a side elevation of the toe of the apparatus and the forward fixed intermediate joint, illustrating the general arrangement and construction of the shown parts; Fig. 9 is a sectional perspective, showing the construction and arrangement of the buckets constituting units of the endless excavating chain; Fig. 10 is a side elevation of one of the turning wheels which is mounted at each hinge of the collapsible framework to carry the endless excavating chain; Fig. 11 is a vertical section of the wheel illustrated in Fig. 10; Fig. 12 is a sectional elevation of the apex of the excavator, showing the manner in which the swinging doors are opened to discharge the contents of the buckets rounding such apex; Fig. 13 is a sectional elevation taken along an axial plane through Fig. 12 to illustrate certain features not clearly apparent from the aforesaid figure; Fig. 14 is a sectional elevation through the toe of the excavating apparatus and showing the arrangement of certain parts not clearly set forth in the preceding figures; Fig. 15 is a sectional view of an arc-shaped runway on the deck of the boat to which the lower end of the stay for the upper crane is slidably affixed; and Fig. 16 shows a modification of the flexible turning joint of the auxiliary track for controlling the discharge doors of the excavating buckets.

Preliminary to a detailed structural consideration of the foregoing illustrated embodiments of this invention, it may be pointed out that the opening up of new waterways is, from a practical standpoint, attended with certain peculiar difficulties, particularly when the excavating is done through the instrumentality of an endless series of buckets.

The practice heretofore has been to cause the bucket to be compactly filled at the start or when in its lowermost position. Upon then raising the initially filled bucket it will usually contact with additional matter, which, while incapable of being collected in the already full bucket, will however tend to further compact the material already gathered therein and thereby render the discharge of the bucket difficult, especially when such material is of a sticky and adhesive nature, such as clay. In accordance with the herein described invention, I propose to adjust the slant of the cutting line of the rising excavating chain to conform with the natural slope of the bank undergoing excavation. As a result, such bank will not tend to slip or collapse during the excavation, and its submerged superficial surface will present uniform conditions to the excavating buckets. The latter will then be so brought against the bank that their cutting edges will extend into the bank for a relatively short distance only, and the amount of material accumulated in the buckets will be due rather to the length than to the depth of cut. As a consequence, but slight strains will be imposed upon each bucket, and the wear on the same will be correspondingly greatly decreased. Furthermore, when collected in this way the contents of the buckets will be found to be soft and soggy, because taken from the superficial submerged face of the bank, as contrasted with the compact and relatively dry state of former practices. Because of this peculiar condition, the discharging or dumping of the buckets is greatly facilitated, the material flowing from the bucket without shock and, because of its mushy condition, being well adapted for being subsequently conveyed to a distant point through a suitable chute. Again, in digging a new canal or in enlarging a preëxisting waterway, the excavator must cut its own way, and this involves many practical problems. The excavating should take place progressively and as rapidly as possible, and a positive central anchorage should be insured. Moreover, the cutting portions of the excavator should be so arranged and positioned that other parts of the apparatus will not interfere with a perfect action thereof.

Turning now to the drawings, 1 denotes the boat which carries the various parts of the excavator proper. As the latter will ordinarily be mounted upon the bow of the boat, I propose to balance the whole by mounting the boiler 2, engine 3 and other parts at the opposite end or stern of the boat. In practice the latter portion may also be utilized for the storage of coal and other supplies, and the quarters of the crew may be also arranged so as to equalize the balance of the whole. The bow of the boat, as shown, is provided with a well 4 through which the depending portions of the excavator pass, and to this end such bow may be bifurcated so as to provide right and left hand supports 5 and 6 carrying corresponding parts of the excavator. As will be ob-

vious, variations in this particular may be resorted to, and the length of the well may be only sufficient to provide for the play of the rearward depending truss of the excavator.

The excavator framework may be considered as consisting of two main parts, one stationary and in fixed relation to the float, and the other hinged to the stationary part and movable with relation to the float so as to vary the depth and slope of cut of the apparatus. The stationary frame may be built up of steel or other suitable material, and may provide a forward truss 7 which rises from the beak 8 of the boat and slants upwardly toward its summit 9. A brace truss 10 may extend from the deck 11 of the boat and connect with such summit to stiffen truss 7 and cross pieces 12 may also be provided if desired. The stationary frame is provided in its upper end or apex with an aperture within which is seated a pillow block 13, see Fig. 13, which may be of cast iron, steel or other suitable material. This pillow block, as shown, is of a somewhat peculiar shape, and comprises two annular flanges 14 and 15, which are spaced apart and secured to the steel or sheet metal work frame in the manner shown. The pillow block is also centrally apertured, and extends inwardly to form an annular bearing 16 which serves as a pivot for the hinge 17 of the upper movable truss 18. Suitably carried by the pillow block is a brass 19, which may be of any preferred construction, and within which is revolubly mounted the journaled end of a shaft 20 which transversely extends through the two sides of the stationary framework and preferably protrudes on one or both sides thereof to make provision for carrying an upper wheel or other means for driving the endless excavating belt.

The truss 18 extends from its upper pivot as aforesaid to the deck of the boat and is arranged to swing about its upper end as a center. While it may be entirely supported from its upper pivot, I prefer to provide roller bearings at its lower end so that the strains may be more evenly distributed and excess weight taken from the upper pivot, and to that end I have mounted flanged wheels 21 on the lower end of said truss. These wheels ride along segmental tracks 22, as will be seen by referring to Figs. 1, 6 and 7. Such tracks may be mounted in any desired manner upon the boat, and they may be positioned by means of the shown braces 23 or otherwise as may prove to be most expedient in practice. The segmental tracks are curved to correspond with the upper hinge of the swinging truss as a center, and accordingly the lower end of said truss will be always supported however it be swung about such center.

The depending truss 24 may be hinged to the swinging truss 18 by means of pillow blocks in the same way that the swinging truss is pivoted at its apex to the stationary frame, or I may mount a transverse shaft 25 with its ends journaled to the swinging truss as shown by Figs. 6 and 7. The depending truss 24 may be arranged to swing about shaft 25 as a pivot, and may be provided at its hinged end with a suitable bearing 26 which fits about said shaft.

The construction of the lower end of said depending truss and the manner of connecting it to its companion to form a movable toe, may be best understood by referring to Figs. 8 and 14, from which it will be seen that truss 24 is also provided with a bearing-piece or pillow block 27, which, like the pillow block at the apex, is apertured and is provided with an inner extension 28 adapted to serve as a pivot for the pillow block 29 of the companion truss 30. This arrangement relieves the shaft 31 of undue binding and enables the latter to freely revolve about its bearing 32. The forward depending truss 30 is also hinged at the beak of the boat by means of a pillow block 33 to the stationary rising frame 7.

It will now be understood that the three links 18, 24 and 30 may be moved into different positions, which will be determinable by the location of the rear intermediate hinge of the structure. This moving may be done through any suitable instrumentality, as for example a worm gearing may be driven by the engine 3 whenever desired, so as to displace the said joint into any suitable position. Or I may provide winding drums which receive cables secured either to the movable intermediate joint or to the toe of the apparatus, as may be preferred.

The excavating is preferably done by means of an endless series of buckets or scoops 33 which are connected together at intervals and carried by an endless belt or chain, as shown more clearly by Figs. 1, 9 and 12. When such endless belt is caused to travel around the supporting framework, the buckets will in rotation be brought against the silt or other material which will thus be continuously removed. It will be noted that in the shown embodiment the cutting edge 34 of each bucket constitutes the outermost portion of the same and that, practically speaking, it is only this portion of each bucket that comes in contact with the material to be excavated. One of the important improvements contemplated by this invention resides in making the cutting edges of the buckets of great strength and of material which is hard and durable. To that end the cutting edge forms the extreme portion of a strap 35 which is substantially of a U shaped contour and is preferably so formed as to slant upwardly toward its

outermost cutting edge, which is sharpened or otherwise brought into a shape adapted to cut into the material to be excavated. This strap will preferably be reinforced by means of side plates 36, which may also constitute the sides of the bucket. Ordinarily these plates will be of less thickness than the cutting portion, and such plates may either be integral with the cutting or body portion or they may be separate therefrom and riveted or otherwise securely affixed thereto. Inasmuch as the cutting portion is in usage subjected to much abrasion, and will in some cases become soon worn away, this portion may be so arranged as to permit of being conveniently replaced from time to time. The outer wall or body portion 37 of the bucket may ordinarily be formed of a cheaper grade of material than the wearing parts, and to that end may be of sheet iron or other suitable inexpensive material. This portion of the bucket may be dished in the manner shown, to form a flat outer curved surface with transverse integral sides, which will extend so as to be overlapped by both the cutting lip and the reinforcing side wall. This dished piece may then be riveted or otherwise secured to the lip and to the reinforcing side wall, as will be readily understood.

This invention also proposes to so fashion and arrange the buckets that each will constitute a unit of an endless excavating chain, and to that end, and inasmuch as it is desirable to dispense with all unnecessary parts, the buckets are secured together through extensions 38 of the reinforcing side walls. The extensions from such walls are ogeed and terminate within the succeeding companion bucket. The attachment follows through a shaft 39 which transversely passes through alined apertures in the cutting lip, the underlying reinforcing side wall and the extension from the side wall of the overlying bucket respectively. The construction of each side wall of the bucket is in this respect identical. Although the buckets are by this arrangement all firmly secured together, and are at the same time capable of being readily replaced for the substitution of fresh buckets, it is advisable to provide means for further reinforcing and driving this endless system. To this end this invention proposes to extend the transverse shafts 39 so that they will protrude slightly beyond the sides of the buckets. These shafts are secured to and joined together by means of a chain, which preferably is built up of an alternating series of overlapping single and duplex links 40: that is to say, embracing two of the shafts, at each end thereof will be two parallel links whose ends overlap single links which extend to the adjacent shafts, and the entire system may be built up in this way. Bearing blocks 41 are interposed between each link and its associated shaft.

A feature of practical advantage may here be noted, by referring to Fig. 10 from which it will be seen that the links 40 of the chain are spread intermediate their ends so as to permit the bearing blocks 41 to be removed when worn by merely moving them toward such spread portion which is sufficiently wide to enable such bearing blocks to be removed. Howbeit, this feature is subject to modification within the scope of this invention, and various arrangements of driving means may be resorted to, although the herein shown form possesses many characteristic advantages. An excavating linkage constructed in this way is well adapted for being driven, and carried by a cog-wheel. Such wheel 42 may be formed in accordance with Figs. 10 and 11, and comprises a periphery 43 of polygonal contour, each facet of which is provided with a suitable projection and seat for the corresponding links of the chain. Thus the one facet 44 will have a middle projection 45 with recessed seats 46 on each side thereof, the middle projection being adapted to protrude through the space betwen the two side links of the chain and engage the hinge thereof, and the side recesses being adapted to seat such links. The adjacent facet 47 will on the contrary comprise a central recess 48 for the single link of the corresponding portion of the chain, and two side projections 49 will be provided for positioning the link and engaging the hinge at each end of the link. In order that such wheel may not be unduly clogged by any dirt or other foreign matter which may be carried by the chain, I prefer to depress the projections between the ends in the manner shown, so as to allow a considerable space between the links and the underlying periphery of the wheel. It will of course be understood that in the case shown any even number of facets may be employed to form the periphery of the wheel, and the latter may be of any size and proportions desirable. These wheels 44, to facilitate the turning of the buckets are of considerable diameter, and are disposed in pairs at each hinge of the collapsible framework, being spaced apart and mounted upon shafts 20, 25, 31 and 50, as shown by Figs. 6, 7, 13 and 14. The linkage of the endless train of buckets rides over the exposed peripheries of these wheels, and the length of the train will not undergo variation when the collapsible runway expands or contracts.

One very important feature of my improved system resides in the facility with which the discharging operation may take place, and which to a large extent is due to the peculiar construction and arrangement of the bottoms or inner walls of the buckets.

This inner wall 51 is not fixed and integral with the body of the bucket, but on the contrary is hinged thereto so as to be capable of opening out at the proper time to allow the material in said bucket to escape therefrom. While some little variation in this particular is permissible within the scope of this invention, the shown arrangement is that which I regard as preferable, and consists in hinging the inner wall of the bucket to the inner bottom edge of the same. A simple construction of this hinge consists in turning the material of the outer wall along its edge so as to form a cylinder 52, within which is a suitable shaft 53. Two or more strips 54 of suitable material are provided in their ends 55 with apertures through which this shaft passes, thus constituting a hinge. These strips are preferably secured to the plate 51 which constitutes the inner wall of the bucket, and such strips preferably are also arranged to carry rollers 56 which by running along a suitable track will normally keep the inner walls of the buckets in a closed position. To readily accommodate these rollers, the strips are provided with upturned bearing blocks 57 through which a shaft 58 passes, and at each end of this shaft is mounted a roller as aforesaid, which will preferably be provided with a bearing periphery and a flange adapted to maintain it upon the track.

The means whereby the hinged doors are maintained closed during the major portion of the travel of the bucket to retain the contents, and whereby such doors are allowed to open at a predetermined station to discharge the contents, will be better understood by referring to Figs. 1, 6, 7, 8 and 12. Each of the trusses carries a section of the auxiliary track 59, which is positioned quite closely to the body of the bucket and serves as a runway for the rollers 56 of the door so that the latter will be held closed, besides affording an auxiliary support for guiding and steadying the endless train of buckets.

Each joint of the collapsible framework is provided with arc-shaped supports 60 which are preferably loosely mounted on the joint shafts 20, 25, 31 and 50 and maintained against rotation therewith by any desired means, such as an attachment to one of the track ends. The track 59 rounds over these supports and, to provide for the pivoting of the trusses, is provided with a suitable expansion joint 61 at each turning point. Such joints may be had by dividing the track so as to form mortised overlapping ends, as will be understood. Or the modification shown by Fig. 16 may be resorted to, in which 62 represents a wheel loosely carried by the joint shaft and 63 the track ends, which are arranged flush and tangential with such wheel so that the door rollers may readily ride over the wheel. At the apex of the framework the railway for the rollers of the hinged sides of the buckets is curved, and follows a path sufficiently below the upper periphery of the turning wheel to permit the lips of the buckets to open and discharge the debris, as illustrated in Fig. 12. When, therefore, the bucket approaches the apex of the frame the rollers of the flap travel along their track, which begins to diverge away from the toothed linkage, and as will be readily understood the flap then begins to open, and finally assumes a substantially vertical position so as to discharge all the material in the bucket. As the bucket then progressively continues its travel the flap will begin to close and will finally be brought into a closed state.

In order that the falling debris may be properly collected this invention proposes a funnel-shaped hopper 64 having discharge outlets 65. The outlets extend to either side of the framework, and as will be understood may be used simultaneously to spread the debris along each bank of the canal as it is being cut, or but one of these outlets may be used at a time and the debris may be spread along one of the banks, according to the preference of the operator.

To enable the debris to be discharged at a distance from the sides of the framework this invention proposes a conveyer pipe 66 which is provided with a series of collars 67 spaced apart at suitable intervals, and to these collars are secured a number of cables 68 which converge toward the point of suspension 69, which is preferably a small carriage 70 arranged to travel along a horizontal track 71 provided by a suitable transverse crane 72. This crane preferably extends to either side of the vertical support, and is pivoted at its middle to a standard 73 which rises from the top of the vertical frame, and such standard at its top has a pivoted cap 74 from which radiate a number of tension cables 75 extending into attachment with suitable portions of the horizontal part of the crane. The weight of the conveyer tube may be equalized by means of a stay 76 fixed to the outer end of the horizontal crane and extending to a suitable traveler 77 guided by a segmental track 78, as will be readily understood from Figs. 2 and 15.

For the purpose of positioning and steadying the boat during the dredging, this invention provides the boat with means for inserting and removing one or more piles or like anchoring means about which the boat may be oscillated so as to cause the excavating chain to swing back and forth and to progressively remove arc-shaped portions of the bank.

Turning to Figs. 1 and 3, it will be seen that the boat carries two small derricks 79 and 80. These derricks are preferably

spaced apart on each side of the center line of the boat, and they may be located at any portion of the boat, either at or intermediate the ends thereof, as shown by the said figures. Underlying the apex or sheave 81 of each derrick is a tubular well 82 through which the associated pile 83 may have a vertical movement, and preferably each well is of a sufficient length to prevent an oscillation in a vertical plane of the contained pile. A rope 84 will pass from the upper end of the pile over the sheave and thence to any suitable hoisting mechanism. In lieu of these derricks any other suitable means for raising or lowering the piles may be resorted to within the scope of this invention. It will now be understood that the boat may be oscillated about either one of these piles, thereby causing the prow or cutting portion thereof to describe an arc and remove a corresponding layer of the embankment in advance of the boat. As soon as the boat has described an arc of the desired length and reached the turning point, which will be on that side containing the embedded pile which acts as a pivot, the more distant pile may be embedded and the first mentioned pile then withdrawn. Upon returning the boat about the newly embedded pile, it will be seen that another arc-shaped layer will be removed from the embankment in advance of the boat, and the latter will at the same time progress slightly, depending upon the distance between the two piles. Thus through the alternative employment of each of these piles, the boat will be caused to progressively advance step by step and at the same time remove any desired width of the embankment ahead of the boat. The advance of the excavator may also be brought about by hawsers affixed to the banks, and other means for the same purpose may be resorted to if desired.

It will thus be seen, without further elaboration, that the disclosed invention is one well adapted to attain the ends and objects hereinbefore pointed out. An excavator made in accordance with this invention will be found to be durable and efficient, and capable of being constructed at a cost which, considering the nature of the work it will perform, will be relatively small. In carrying out this invention some parts might be employed without others and the new features thereof may be combined with elements old in the art, although the herein described type is regarded as the preferred one, and as being a substantial improvement over many of such obvious or implied variations or arrangements.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An excavating apparatus comprising in combination a plurality of trusses hinged together to form a collapsible polygonal framework, one of said trusses being stationary, and an endless train of excavating buckets mounted to travel around said framework.

2. An excavating apparatus comprising in combination a collapsible framework comprising a plurality of hinged trusses, one of said trusses being immovable and providing at each end a fixed pivot about which another of said trusses may swing, and an endless train of excavating buckets mounted to travel around said framework.

3. An excavating apparatus comprising in combination a stationary derrick, a pair of depending trusses pivoted at the upper and lower ends of said derrick respectively, an inextensible link hinged to and connecting the free ends of said trusses, and an endless excavating chain mounted to travel around the periphery of the aforesaid parts.

4. An excavating apparatus comprising in combination a plurality of trusses hinged at adjacent ends to form a collapsible polygonal framework, one of said trusses being immovable and forming a stationary derrick and extending upwardly, and an endless excavating chain mounted to travel around said framework and discharge debris near the summit thereof.

5. An excavating apparatus comprising in combination a plurality of trusses hinged at adjacent ends to form a collapsible polygonal framework, one of said trusses being stationary and slanting upwardly and terminating to form a fixed apex about which a companion truss may swing, and an excavating chain mounted to travel around said framework.

6. An excavating apparatus comprising in combination a plurality of trusses hinged together at their adjacent ends to form a collapsible polygonal framework, the apex and foot of one of said trusses being fixed in position and adapted to serve as pivots about which companion trusses may swing to raise or lower the toe of said framework, and an endless train of excavating buckets mounted to travel around said framework.

7. An excavating apparatus comprising in combination a float, a stationary derrick carried thereby, a truss pivoted to swing from the apex of said derrick, depending trusses hinged to the lower portions of said swinging truss and said derrick respectively and converging to form a toe, and an endless chain of buckets mounted to travel around the aforesaid framework, whereby upon swinging said swinging truss the toe of said framework may be raised or lowered to excavate at different depths.

8. A collapsible polygonal framework comprising two upper trusses converging toward a fixed apex, one of said trusses being immovable and the other being adapted to swing about said apex, a segmental track supporting the lower end of said swinging truss, and a pair of depending trusses converging toward a hinged toe, the one being hinged and depending from said swinging truss and the other from said immovable upper truss.

9. A collapsible polygonal framework comprising a pair of upper trusses converging toward a fixed apex, and a pair of lower depending trusses converging toward a movable toe, one of said upper trusses being hinged to swing about said apex and the other being immovable, a segmental track arranged to carry the lower end of said swinging truss, and a train of excavating buckets mounted to travel around said framework to gather material at the bottom thereof and discharge the same at the fixed apex.

10. An excavating apparatus comprising in combination a float, a collapsible polygonal framework mounted on said float at one end thereof and with the lower portion of said framework submerged, means for expanding or collapsing said framework to raise or lower the toe thereof, and an excavating means arranged to remove debris from a point adjacent said toe and discharge the same at a point overlying said float.

11. An excavating apparatus comprising in combination a vehicle, a collapsible polygonal framework carried by said vehicle on the bow thereof, said framework providing a fixed point of discharge, and an endless excavating belt mounted to travel around said framework and discharge debris at said point.

12. An excavating apparatus comprising in combination a boat, a collapsible polygonal framework carried by said boat on the bow thereof and composed of a plurality of inextensible hinged links or trusses forming the sides of the polygonal framework, one of said trusses rising from the beak of said boat, whereby said framework may be collapsed or expanded without varying the length of its periphery, and an endless excavating chain mounted to travel around said constant periphery.

13. An excavating apparatus comprising in combination a vehicle, a plurality of trusses supported by said vehicle and converging upwardly to form an apex, one of said trusses being adapted to swing about said apex as a center and another being immovable and rising from the extreme end of said vehicle, and an endless excavating belt mounted to travel along said trusses.

14. An excavating apparatus comprising in combination a vehicle, a plurality of trusses carried thereby, one of said trusses rising from the extreme end of said vehicle and converging upwardly with another toward an apex, said apex being fixed in position relatively to said vehicle and one of said trusses being adapted to swing about said apex as a center, and an endless excavating belt guided in its travel by said trusses.

15. An excavating apparatus comprising in combination a vehicle, a plurality of trusses carried thereby, one of said trusses rising from the extreme end of said vehicle and converging upwardly with another to form an apex, one of said trusses being arranged to swing about said apex as a center, a segmental track carried by said vehicle and supporting the lower ends of said swinging truss, and an endless excavating chain mounted to travel around the periphery of said trusses.

16. An excavating apparatus comprising in combination a vehicle provided with a well coinciding with the longitudinal center and located in the forward end of said vehicle, a collapsible polygonal framework arranged partly in said well and having portions extending above and below said well, said framework comprising two links hinged together, said hinge being adapted to be displaced into different positions relative to said vehicle, whereby the collecting portions of an excavating means may be raised or lowered, and an endless excavating means mounted to travel around the periphery of said framework.

17. An excavating apparatus comprising in combination a vehicle, a pair of trusses converging upwardly to form an apex, one of said trusses being hinged at said apex and adapted to swing thereabout, a track carried by said vehicle upon which the lower end of said swinging truss is supported, a pair of depending converging trusses, the one being hinged to the lower end of said swinging truss and the other to said vehicle, and an excavating means adapted to be guided in its travel by said trusses and arranged to discharge material in proximity with the apex.

18. An excavating apparatus comprising

in combination a vehicle, a pair of trusses carried thereby and converging to form an upper hinged joint about which one of said trusses may swing, a segmental track arranged to support the lower end of said swinging truss, said track having a curvature inscribed by the bearing end of the swinging truss, a pair of swinging trusses hinged together at their lower ends to form a toe, the one truss being hinged to the forward end of said vehicle and the other to the free end of said swinging truss, and an excavating means mounted to travel around said trusses and discharge material adjacent the upper hinged joint thereof.

19. An excavating apparatus comprising in combination a vehicle, a stationary framework carried thereby and rising from the extreme end thereof, a collapsible framework comprising a truss pivotally swung from an upper fixed pivot provided by said stationary framework, and an endless excavating chain mounted to travel around the periphery of said framework and discharge material adjacent said upper pivot.

20. An excavating apparatus comprising in combination a vehicle, a stationary framework rising from the extreme end thereof, a swinging truss converging toward the summit of said stationary framework and pivoted thereto, the lower ends of said swinging truss and said stationary framework being connected by a plurality of hinged trusses arranged to provide a lower toe, whereby upon swinging the lower end of said swinging truss said toe may be raised, and a train of excavating buckets mounted to travel around said framework.

21. An excavating apparatus comprising in combination a vehicle provided with an elongated well in its forward end, a segmental track rising at each side of said well, the radii of said tracks centering at a point overlying said well and to the rear of the extreme end of said vehicle, a swinging truss having a lower end arranged to travel upon each track, a truss hinged to and depending from the lower end of said upper trusses, a companion truss hinged to the end of said vehicle, said depending trusses converging to form a hinged toe which may be raised by moving the lower end of said swinging truss, and an endless train of excavating buckets mounted to travel around the periphery of said trusses.

22. An excavating apparatus comprising in combination a vehicle, a collapsible diamond-shaped framework carried thereby, one of the intermediate joints of said framework being adjustably mounted on said vehicle and the other affixed to the end thereof, whereby the former may be moved relative to the latter to raise or lower the toe of said framework, and an endless excavating chain mounted to travel around the periphery of said framework.

23. An excavating apparatus comprising in combination a vehicle, a plurality of trusses hinged to form a collapsible diamond-shaped framework, a curvilinear track carried by said vehicle and arranged to support one of the intermediate hinges of said collapsible framework, the other being affixed to the extreme end of said vehicle, whereby the former may be retreated to raise its toe, and an endless excavating chain mounted to travel around said framework.

24. An excavating apparatus comprising in combination a vehicle, a plurality of trusses hinged at meeting ends to form a diamond-shaped collapsible framework, a segmental track whose center of curvature is the apex of said framework, the rearward intermediate joint of the latter being arranged to travel along said track to raise or lower the toe of said framework, the forward intermediate joint being affixed to said vehicle, and a train of excavating buckets mounted to travel around the periphery of said framework.

25. An excavating apparatus comprising in combination a boat, a collapsible polygonal framework arranged to coincide with the longitudinal axis and carried by the bow of said boat, the upper end of said framework being fixed and serving as a pivot about which one of the depending members of said framework may be swung, the other depending member constituting a stationary framework carried by said vehicle and serving as a support for said upper pivot, said stationary framework rising from the beak of said boat.

26. In excavating apparatus, in combination, an excavating bucket comprising a body portion having a wall provided with a cutting edge, and a swinging discharge door hinged to said body portion and located opposite said wall, a runway causing said bucket to travel in a predetermined path, and an auxiliary runway for holding said door closed during the major portion of the travel of said bucket and permitting said door to open at a predetermined station.

27. An excavating apparatus comprising, in combination, a frame work, and an endless excavator mounted to travel around said frame work, said excavator comprising a series of buckets, one of the walls of each of said buckets being provided with an extension whereby said bucket is pivotally connected to the succeeding bucket.

28. An excavating apparatus comprising, in combination, a frame work, and an endless excavator mounted to travel around said frame work, said excavator comprising a

series of buckets, the side walls of each of said buckets being provided with extensions whereby said bucket is pivotally connected to the succeeding bucket.

29. In excavating apparatus, in combination, an excavating bucket comprising a body portion having a wall provided with a cutting edge, a discharge door opposite said wall, said door being hinged to said body portion of the bucket at its lower end, a runway causing said bucket to travel in a predetermined path, and an auxiliary runway for holding said door closed during the major portion of the travel of said bucket and permitting said door to open at a predetermined station.

30. An excavating apparatus comprising in combination a collapsible framework comprised of a plurality of hinged trusses, one of said hinges consisting of an apertured block affixed to one of said trusses and providing a bearing serving as a pivot for the companion truss, and a shaft revolubly mounted within the aperture of said block.

31. An excavating apparatus comprising in combination a collapsible framework, a chain adapted to travel around said framework, a bucket carried by said chain, the side of said bucket adjacent said chain being provided with a hinged door adapted to be opened to discharge the contents of said bucket, and a runway maintaining closed said door while said bucket is conveying material to the discharge point.

32. An excavating apparatus comprising in combination a collapsible polygonal framework, a chain adapted to travel around said framework, buckets carried by said chain and radiating from said framework, and a hinged door on the side of each bucket adjacent said chain, whereby the contents of said bucket may be discharged at a predetermined station.

33. An excavating apparatus comprising in combination a vehicle, a collapsible polygonal framework having at each joint thereof a turning wheel, an endless chain mounted to travel around said wheels, one of said wheels being adapted to drive said chain, excavating buckets carried thereby, and means for discharging the contents of each bucket at a point fixed relatively to said vehicle, a chute for receiving and conveying the contents of said buckets, and an overlying crane for carrying said chain, whereby it may be freely moved into diverse positions to deliver said contents at any predetermined point.

34. An excavating apparatus comprising in combination a jointed runway, turning wheels at each joint thereof, an endless series of connected excavating buckets, an endless chain also attached to said connected buckets and carried by said wheels, and means for driving said chain to propel said connected buckets.

35. An excavating apparatus comprising, in combination, a traveling chain, certain of the links of said chain being spread intermediate their ends, a bearing block seated in the crotch formed by the ends of each of said links and adapted to be disengaged by moving it toward the spread portion of said link, and an excavating bucket secured to each block.

In testimony whereof I affix my signature, in the presence of two witnesses.

THOMAS F. LONNEY.

Witnesses:
ARTHUR G. PREVIN,
H. M. SEAMANS.

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[Fourth Edition.]

A.D. 1864, 4th *May*. N° 1124.

Artificial Stone.

LETTERS PATENT to John Potter, of the City of Manchester, Civil and Consulting Engineer, for the Invention of "**A New Compound or Composition for Artificial Stone, and for certain Machinery or Apparatus to be used in Mixing and Applying the said Composition.**"

Sealed the 28th October 1864, and dated the 4th May 1864.

PROVISIONAL SPECIFICATION left by the said John Potter at the Office of the Commissioners of Patents, with his Petition, on the 4th May 1864.

I, John Potter, of the City of Manchester, Civil and Consulting Engineer, do hereby declare the nature of the said Invention for "**A New Compound or Composition for Artificial Stone and for certain Machinery or Apparatus to be used in Mixing and Applying the said Composition,**" to be as follows:—

The first part of my Invention consists in forming or producing a certain description of artificial stone by the admixture of siliceous sand with a certain proportion of metallic iron in a state of comminution. The proportion of the metallic iron to the sand may be in the ratio of from 3 to 10 parts or more of iron powder to 100 parts of sand by measure; but the quantity of iron powder required will depend upon its fineness and also upon the purity of the sand; generally the finer the iron powder is the smaller the quantity of it will be sufficient. The proportionate quantity of the two ingredients will also depend on the purpose to which the artificial stone is to be applied. As a general rule the harder the artificial stone is required to be, and the larger

[Fourth Ed.]
PRICE 1/-

the quantity of the iron powder in proportion to the sand will be necessary. Borings or turnings of iron, when sufficiently fine, will answer the purpose of the iron powder here mentioned.

The second part of my Invention consists in the formation of sea walls (in particular) of the artificial stone, or facing embankments formed of earth with the same, and also artificial foundations for buildings or erections, also forming the same into blocks for building and other purposes, or pieces of a variety of forms, by casting the same in moulds, and thus giving the finished piece any shape that may be required. After the composition is mixed it is necessary that it should be moistened with water, which will in general be best done after the composition is in the mould, or form, or place wherein it is to take its shape. Water containing a quantity of common salt or sal ammoniac will in general be found to be advantageous for this purpose.

The third part of my Invention relates to apparatus for conveying the materials from place to place and mixing the same. The conveying apparatus consists in applying tubes or pipes combined with other apparatus. The continuous tube being placed at a certain inclination the materials are elevated by other apparatus, and discharged into the upper end, they then flow down the tube to their destination. The mixing apparatus consists of two funnels, into one of which the siliceous sand is placed, whilst the iron powder is placed in the other. As the materials descend from the funnels they are measured by means of slides or stops, the slides or stops acting simultaneously in descending pipes or tubes. The two pipes discharge the materials into one, after which they pass or are placed in the compounding apparatus, in which they are more perfectly mixed by being stirred or agitated together. The compounding apparatus consists of a hollow cylinder open at each end, placed in an inclined position and revolving on an axis. The composition enters the hollow cylinder at the upper end, and is discharged at the lower end.

The fourth part of my Invention consists in the application and adaptation of certain apparatus or means to the purpose of facilitating the application of the artificial stone to useful purposes. I construct boxes or cassoons of wood or metal of a suitable size or form. Into these the mixed materials are poured, and being wetted as before mentioned, are left to harden into a solid mass. I also apply the artificial stone as a substitute for piles of wood or iron, this I effect by means of tubes, at one end of which is a loose tip or point. The tube being driven into the earth (with the point foremost) a sufficient depth, the tube is filled with the composition, the tube being then withdrawn, the loose tip is left in the earth, and the hole as the tube is withdrawn becomes filled with the composition, which being wetted hardens in the usual manner.

In certain cases, however, instead of extracting the tube I leave it in the earth, and the same also with the cassoons formed of wood or metal.

The fifth part of my Invention consists in producing the iron powder directly from certain ores or oxides of iron, which are naturally or may be reduced to the state of powder; this powder being mixed with a proportionate part of carbonaceous matter, and exposed to heat in a retort or other suitable vessel, will give the iron powder required.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said John Potter in the Great Seal Patent Office on the 3rd November 1864.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOHN POTTER, of the City of Manchester, Civil and Consulting Engineer, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Fourth day of May, in the year of our Lord One thousand eight hundred and sixty-four, in the twenty-seventh year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said John Potter, Her special licence that I, the said John Potter, my executors, administrators, and assigns, or such others as I, the said John Potter, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "A NEW COMPOUND OR COMPOSITION FOR ARTIFICIAL STONE AND FOR CERTAIN MACHINERY OR APPARATUS TO BE USED IN MIXING AND APPLYING THE SAID COMPOSITION," upon the condition (amongst others) that I, the said John Potter, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said John Potter, do hereby declare the nature of my said Invention, and in what manner the same is to be

performed, to be particularly described and ascertained in and by the following statement and accompanying Drawing (that is to say):—

My Invention consists, first, in the application and adaptation of a new compound or composition for forming or producing a certain description of artificial rock or stone.

The second part of my Invention consists in the application of the artificial stone to the purposes of constructing sea walls (in particular); also constructing, facing, or strengthening embankments; also forming artificial foundations for buildings and other erections; also for forming the same into blocks for building and other purposes.

The third part of my Invention consists, first, in the application and adaptation of certain machinery to the purpose of conveying the materials from place to place; second, in the application and adaptation of certain machinery to the purpose of apportioning and measuring the respective quantities of the several materials; third, in the application of certain machinery to the purpose of mixing, combining, and compounding the different materials.

The fourth part of my Invention consists in the use and application of boxes or caissoons, for the purpose of giving to the artificial stone a particular shape or form, or retaining it during the process of hardening. I also use these boxes or caissoons in certain cases to retain permanently the artificial rock. I also use the artificial rock as a substitute for piles which are usually made of wood or iron.

The fifth part of my Invention consists in producing the iron powder directly from certain ores or oxides of iron.

In order to make my Invention more clearly understood, I have hereunto annexed a Sheet of Drawings, to which the following description relates, and in which the same letters or figures of reference, or letters and figures conjoined indicate the same parts.

The compound or composition of artificial stone or rock, constituting the first part of my Invention, I produce as follows:—I procure siliceous sand (of which river sand and sea sand are the best natural specimens), and metallic iron in the state of powder. Borings, turnings, filings, or other remnants of cast or wrought iron, when sufficiently fine, answer the purpose of the iron powder; but I also produce the iron powder from certain ores or oxides of iron. The proportions of the two ingredients may be varied, but in general fourteen part of siliceous sand to one of iron powder, by measure, or ten parts of siliceous sand to one of iron powder, by weight, will form an efficient composition for most purposes to which the artificial stone can be

applied: but these proportions may be varied, and in general the more the quantity of the iron powder, the harder the resulting artificial rock will be. A certain amount of other materials or impurities may be admitted into the composition according to the purpose to which the artificial stone is applied. The ingredients being well mixed together and moistened with water, become converted in a short time into artificial rock.

The second part of my Invention relates to certain applications of the artificial stone or rock. First in the formation of sea walls or embankments to fence out the sea, or the strengthening of such structures. For this purpose I make use of the sand hills and other accumulations of sand on the sea shore: this I mix with the iron powder as before described. If the wall is to be constructed entirely of the artificial rock, I first construct a caissoon or chamber of slabs or other inferior timber or material, and fix the same on a spot where the wall or a portion of it is to be erected. The caissoon is then to be filled with the composition of sand and iron powder before described. The composition may be wetted with water before being placed in the caissoon, or it may be put in in a dry state, (which will in many cases be most convenient), and afterwards wetted or left to be moistened by rain or water from other natural sources.

Another mode of constructing sea walls (which in general I prefer) is as follows:—I build a slight wall of some harder material, which I support by placing behind it a mass of the artificial rock. This will be understood from Figs. 5 and 6, in which Fig. 5 represents a section, and Fig. 6 a plan.

A, A, slight wall of some hard material; B, B, mass of artificial rock supporting the wall. The composition is to be confined by a hoarding or other means, until it is sufficiently set to support itself and the wall without assistance. Second, embankments formed of earth I secure by coating them with the artificial rock, the thickness of which must be regulated by circumstances, and which may be two, three, or more feet. The external surface of the coating may afterwards be indurated as will be more particularly explained hereafter.

Another mode of strengthening embankments formed of earth is shewn in section in Fig. 7, which is also applicable to embankments already made. In this case I form a trench through the embankment lengthwise, of a proper form and dimensions, and fill it with the composition, which being wetted hardens into rock; C, C, the earth forming the embankment; D, D, the artificial rock. The trench may in many cases be made in the form of a curve, so that the artificial rock will constitute an arch supported on abutments at each termination of the embankment.

Third, in making artificial foundations, the process of which is simply making an excavation of sufficient dimensions, and of a depth corresponding to the weight of the erection to be placed upon it. The depth may consequently vary from one foot to six feet or more, according to the weight or pressure of the superstructure, and is to be filled with the composition in the manner before described. If a very heavy erection is to be placed on a foundation, it will be advantageous to insert in the composition long and thin strips of iron, which will greatly add to its tenacity and strength.

Fourth, for forming blocks of artificial stone, I provide boxes or moulds of the dimensions and shape required. These are filled with the composition in the manner already described, and left to harden a sufficient time. A ready and cheap mode of effecting the same is as follows:—I prepare a model of the proposed block, I then dig a hole in the earth in which I place the model, and ram the earth firmly round it; the model is then withdrawn, and the space filled with the composition, which is then slightly covered with earth and left to harden. In this manner a single model will answer the purpose of forming moulds for an immense number of blocks.

The third part of my Invention relates to machinery for conveying, apportioning, and compounding the materials. Fig. 1 represents a side view of the conveying apparatus; E, E, a tube of metal or other suitable material placed in an inclined position, and supported by scaffolds F, F, &c. The materials are elevated and discharged into the upper end of the tube E, E, down which they pass, and are discharged at the lower end at the place required. A convenient mode of elevating the materials is shewn in the Figure, where E1 represents a moveable elevating tube turning on a centre E2, fixed on the scaffolding. On the tube E1 being elevated into the position shewn by dotted lines, it becomes connected to the tube E, E, forming one continuous tube. The other end of the tube E1 is furnished with a funnel, into which the materials are placed. When the distance to which the materials are to be conveyed is considerable, it will be necessary that the lower end of the tube E, E, should discharge the materials into a funnel at the end of another elevating tube similar to the one shewn at E1; this last discharges the materials into another tube similar to E, E; and the process of conveying the materials may thus be continued to any extent that may be required. The inclination of the tubes will depend greatly on their smoothness inside: the smoother the interior is the less inclination will be required.

Fig. 2 represents a side elevation of one mode of constructing the apportioning apparatus. G, a funnel or hopper in which the sand is to be placed; from this descends the tube or pipe G1, G1; in this tube work the two slides G2

and G3. H, another smaller funnel or hopper in which the iron powder is placed; from this descends the tube or pipe H1, H1; in this tube works the two slides H2 and H3. The two slides G2 and H2 are actuated by means of connecting rods from the lever I, turning on the centre I1, and the two slides G3 and H3 are actuated by means of connecting rods from the lever J turning on the centre J1. The lever I has a lower arm I2, and betwixt this lower arm and the lever J plays the upper end of the lever K, turning on the centre K1. To the lever K, a reciprocating motion being given, it acts alternately (by this arrangement) on the levers I and J. When it acts on the lower arm I2, of the lever I, the slides G2 and H2 are withdrawn from the tubes G1 and H1, the portion of the tube G1, above the slide G3, becomes filled with sand, and the portion of the tube H1, above the slide H3, becomes filled with the iron powder. On the reverse motion of the lever K, the slides G2 and H2 are allowed to close, and the slides G3 and H3 are withdrawn from the respective tubes, and the sand and iron powder descend into the funnel or hopper L, from which they are conducted to the compounding apparatus, in which the ingredients are more perfectly mixed together. The slides when not withdrawn by the action of the lever K, are closed by means of a worm or other spring (not shewn in the Drawing) connecting the arm I2 with the lever J. A vibratory motion is communicated to the lever K by any adequate power. The proportionate quantities of the two ingredients will depend on the relative capacities of the tubes G1 and H1.

Another apparatus to be used for the same purpose is shewn in Fig. 3. In this construction the slides are dispensed with, and wheels or drums having vanes or buckets upon them are substituted instead; G, the funnel or hopper in which the sand is placed; G1, G1, the pipe or tube descending from the same; H, the funnel or hopper in which the iron powder is placed; H1, H1, pipe or tube descending from the same; L, the funnel or hopper which receives the combined ingredients from the pipes G1 and H1. These parts are respectively the same as those shewn in Fig. 2. G4, a wheel or drum furnished with vanes or buckets and turning on axis; it works in a box or case attached to the tube G1, G1, and forming part of it. The sand descending through the pipe G1, G1, enters the buckets of the drum G4, giving motion to it, and is discharged from it into the lower part of the tube G1. H4, a similar drum working in a case or box attached to the tube H1, H1. The iron powder descending the tube H1, H1, fills the buckets of the drum H4, and from thence is discharged into the lower part of the tube H1. From the lower orifices of the tubes G1 and H1 the ingredients are discharged into the hopper or funnel L, or other receptacle, from whence they are conveyed

to the compounding apparatus. A pulley or drum is fixed on the axis of the drum G4; this pulley gives motion to the drum H4 by means of a strap or band which passes over another drum or pulley on the axis of the drum H4. The relative velocities of the two drums G4 and H4 (and consequently the relative quantities of the two ingredients delivered) will be regulated by the relative sizes of the two band pulleys or drums, and by varying the respective sizes of these pulleys or drums the proportionate quantities of the two ingredients may be regulated to any degree of nicety which may be required. The same results will obviously be produced by using toothed wheels instead of these pulleys or drums. The working velocity of the apparatus may be regulated by means of a brake or fan, or by being connected to some moving power. If it should be required to add a third ingredient, another funnel with its descending tube and appurtenances may be added to the apparatus, and so on.

Fig. 4 represents a side view (shewn partly in section) of the mixing and compounding apparatus. M, M, two end frames which support the moving parts; N, N, axis, supported in an inclined position, and turning in bearings attached to the end frames M, M, N1, N1, a hollow cylinder attached to the axis N, N, by means of rings furnished with internal arms. The interior of the cylinder may be furnished with a number of small vanes which will facilitate its action on the materials. N2, driving pulley or wheel, by which motion is communicated to the axis N, N. N3, N3, two discs, fixed on the axis N, N, and revolving with it; the use of which is to prevent the materials getting into the bearings and abrading and destroying the rubbing surfaces. O, a hopper furnished with a descending tube, into this the materials are placed and are conducted by the descending tube into the interior of the upper end of the cylinder N1, N1, by the rotation of which they are effectually mixed and compounded together, which being effected they fall out of the cylinder at its lower end on to the floor or into a receptacle prepared to receive them. The inclination of the axis N, N, is to be regulated so that the ingredients may be properly mixed without being too long detained in the interior of the cylinder. To render the above machines fully effectual it will be proper that the materials should be in a dry state.

The fourth part of my Invention relates, first, to the application and adaptation of boxes or caissoons, made of various shapes or forms as may be required, they may be constructed of wood or metal, and being filled with the composition (kept in a moist state a sufficient length of time), a block of artificial stone is produced, which being removed from the caissoon, and indurated when necessary, is ready for use. I also use the caissoons filled with the artificial rock in certain cases where it is required to have blocks or masses of the

artificial rock applied so as to act by their weight as well as by their size or strength. In this case the caisson is not removed, but remains as an external covering to the artificial rock. Second, I apply the artificial stone as a substitute for piles of wood or metal in the following manner:—

Figs. 8 and 9 represent the apparatus shewn principally in section. P, P, a tube of metal, at the lower end of which is the loose tip Q. The tube P, P, is constructed in lengths, which can be coupled together when required; R, a bracket fixed across the interior of the lowermost length of the tube. The tube is to be driven a sufficient depth into the earth, when this is effected a hook of a proper construction attached to a rope or chain is lowered down the interior of the tube, so as to take hold of the bracket R; by this means the metal tube is to be withdrawn out of the earth, previous to which a quantity of the artificial stone composition is to be poured into the interior of the tube, and as the tube is being withdrawn fresh quantities of the composition are to be supplied. When the tube is therefore wholly withdrawn the space previously occupied by it will be filled with the composition, which in time will be converted into artificial stone. The loose tip Q is by this operation left in the earth and serves as a foundation on which the pile rests. In some cases it will be desirable to leave the tube itself in the earth.

Fig. 10 represents a section of an artificial foundation resting on piles as above described; S, S, S, S, piles of the artificial stone; T, T, mass of the artificial rock resting on the piles. On this mass the building or erection is to be constructed.

The fifth part of my Invention relates to the production of the metallic iron powder directly from certain ores of iron, (such as the hematites, martial pyrites, or the same after a portion of the sulphur has been extracted or such others as may be sufficiently rich in iron) or oxides of iron (such as the black and red oxides) produced in various processes in the arts. If the ore or oxide is not naturally in a state of powder it will have to undergo the process of grinding. The powdered ore or oxide is next to be mixed with as much carbonaceous matter as will reduce it to the metallic state. This will vary according to the nature of the ore or oxide under process, but in general, one-tenth to a fifth part of absolute carbon in the carbonaceous matter will be sufficient. Generally, mixtures of the ores and oxides will be advantageous, as by a judicious apportioning and selection of them a less quantity of carbonaceous matter will be required, and the process of reduction accomplished with greater economy. The addition of a quantity of flux (such as carbonate of lime) will in most cases be advantageous. The mixture is next to be exposed to heat for three or four hours in a retort or other suitable vessel. The heat

should be gradually raised, but should not be raised so high as to melt the iron. Different ores and oxides of iron will however require variations in the treatment in order to bring them to a metallic state, but these variations being well known to metallurgists need not be further mentioned here. The mass being allowed to cool will be the metallic iron powder required, mixed with some amount of impurity, which, however, if the process has been well conducted will not be injurious. Instead of using water for the purpose of moistening the composition, a solution of common salt or sal-ammoniac will be advantageous to hasten the process of conversion. A solution of copperas (sulphate of iron) is however the best which I have so far been able to discover for this purpose. When the artificial stone is once formed, and it is requisite that it should be indurated to resist the effects of the atmosphere and attrition, quicklime in the state of solution, or milk of lime may be applied to it with good effect, as also other stone preserving applications. A certain amount of impurities may also be admitted into the composition, but generally with injurious effect. However carbonate of lime in the state of powdered limestone, powdered chalk, or whiting may be used for some purposes with good effect to the extent of one-tenth part or more of the whole or thereabouts; but the application of these substances is to be regarded simply as adventitious and as forming no part of my present Invention.

Having thus described the nature of my Invention, and the manner in which the same is to be performed, I would have it understood that I do not confine myself to the precise details of construction and arrangement of the mechanism and apparatus herein described, as these may be varied, but that what I claim as new and of my Invention is as follows:—

Under the head of the first part of my Invention I claim, the application and adaptation of a combination of siliceous sand and metallic iron in the state of powder (into which combination other materials may be admitted to a certain extent) for the purpose of producing artificial stone or rock as herein described.

Under the head of the second part of my Invention I claim, first, the application and adaptation of the artificial rock or stone to the purpose of constructing sea walls and embankments to fence out the sea (in particular); also constructing, facing, or strengthening embankments in general: second the application and adaptation of the artificial rock or stone to the purpose of forming artificial foundations for buildings and other erections: third, the application and adaptation of the artificial stone or rock to the purpose of forming blocks for building and other purposes, as herein set forth and described.

Under the head of the third part of my Invention I claim, first, the application and adaptation of the conveying apparatus shewn in Fig. 1; second, the application and adaptation of the opportioning apparatus shewn in Figs. 2 and 3; and, third, the application, and adaptation of the compounding apparatus shewn in Fig. 4 as herein set forth and described.

Under the head of the fourth part of my Invention, I claim, first, the application and adaptation of boxes or caissons for the purpose of giving various shapes or forms to the artificial stone or rock, or permanently retaining the same; second, the application and adaptation of the artificial rock or stone as a substitute for piles of wood or metal and the apparatus for applying the same as shewn in Figs. 8 and 9, and herein set forth and described.

Lastly, under the head of the fifth part of my Invention I claim, the application and adaptation of certain ores or oxides of iron to the purpose of producing the metallic iron powder, or the mode or process of effecting the same, so as to make the iron powder so produced, applicable and effective to the purpose of producing the artificial stone or rock as herein set forth and described.

In witness whereof, I, the said John Potter, have hereunto set my hand and seal, this Second day of November, in the year of our Lord One thousand eight hundred and sixty-four.

JOHN POTTER. (L.S.)

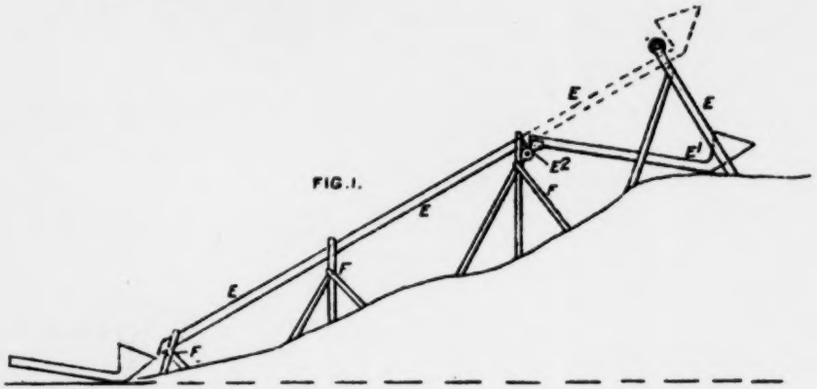
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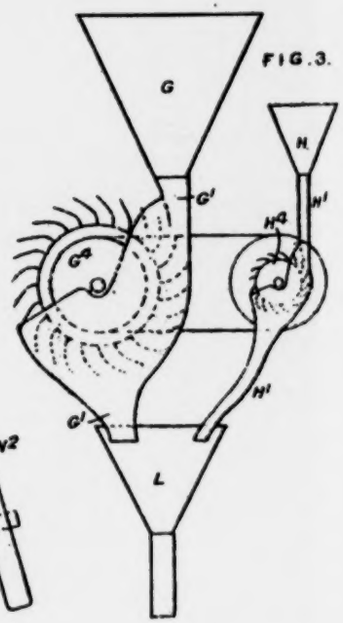
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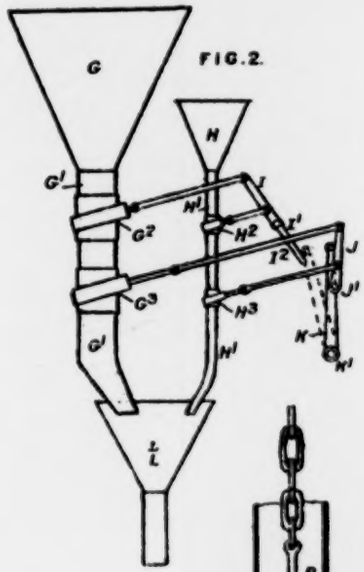
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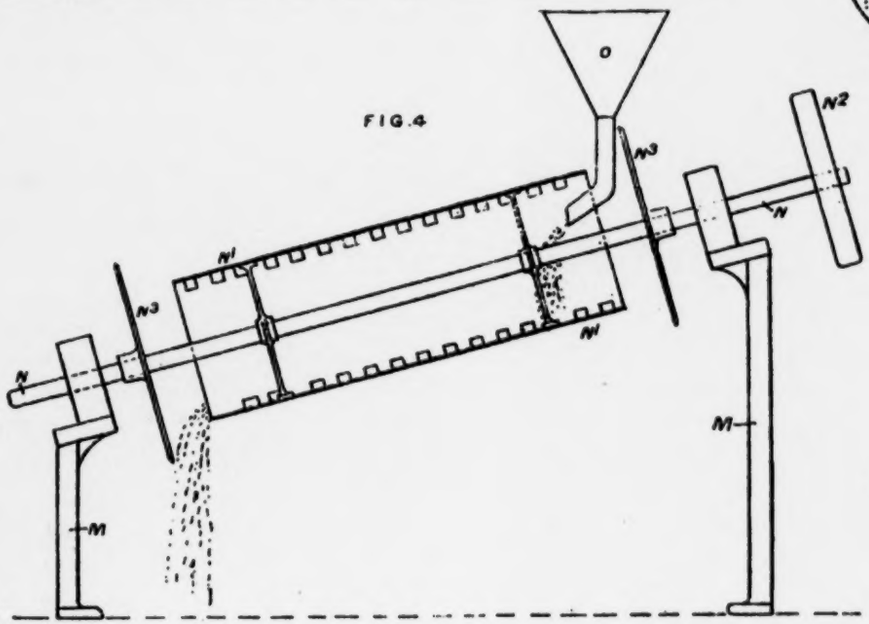
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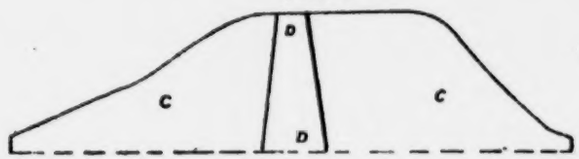
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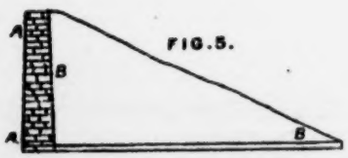


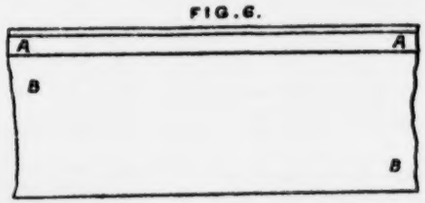


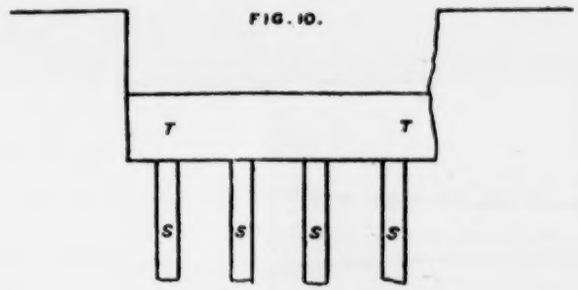












[This Drawing is a reproduction of the Original on a reduced scale]

The filed drawing is partly colored.

[Second Edition.]

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A.D. 1872, 22nd OCTOBER. Nº 3107.

Machinery for Storing Grain and Seed.

LETTERS PATENT to Edward Bayzand Ellington and Joseph Liddell Anderson, both of the City of Chester, Engineers, for the Invention of "IMPROVEMENTS IN MACHINERY FOR THE STORING OF GRAIN AND SEED.

Sealed the 20th December 1872, and dated the 22nd October 1872.

PROVISIONAL SPECIFICATION left by the said Edward Bayzand Ellington and Joseph Liddell Anderson at the Office of the Commissioners of Patents, with their Petition, on the 22nd October 1872.

We, EDWARD BAYZAND ELLINGTON and JOSEPH LIDDELL ANDERSON, both of the City of Chester, Engineers, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN MACHINERY FOR THE STORING OF GRAIN AND SEED," to be as follows :—

This Invention has for its object improvements in the machinery employed in warehousing grain and seed in bulk, the grain being elevated by means of cranes, hoists, or other known appliances, and distributed over the warehouse by creepers or travelling carrying bands. At the point or points where the grain leaves the creepers or bands we

place spouts mounted so that they can be made to revolve, into which the grain passes, and by swinging these spouts the grain is directed to any desired point.

We also employ similar spouts to distribute grain from the elevator on to any one of a number of creepers or bands radiating from the elevator. By combining two or more of such spouts so that each will command all the creepers or bands the grain can be taken from two or more points, generally elevators, and sent from either or all down to any one, two, or more of the creepers or bands.

The revolving spouts may also be so arranged as to receive the grain from one travelling band, and either to deliver it on to other travelling bands at a lower level, which convey the grain to different parts of the warehouse, or by turning the spout it may be made to deliver the grain directly on to the floor or into shoots.

In cases where a travelling band is passed at one or more points over and under two guide rollers, situated the one below the other, so that different portions of the band are thereby at different levels, the said spouts may be placed so as to receive the grain from the part of the band at the higher level, and either to deliver it on to the part of the band at the lower level, or by turning the spout it may be made to deliver the grain on to other bands or creepers, or directly on to the floor or into shoots.

These revolving spouts may either be moved and set directly by hand or they may be shifted by wire ropes, bands, or rods connected from them to levers mounted at a central point of the warehouse, so that an attendant at that point can by moving the levers alter the directions of the several spouts.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Edward Bayzand Ellington and Joseph Liddell Anderson in the Great Seal Patent Office on the 18th April 1873.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, EDWARD BAYZAND ELLINGTON and JOSEPH LIDDELL ANDERSON, both of the City of Chester, Engineers, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-second day of October, in the year of our Lord One thousand eight hundred and seventy-two, in the thirty-sixth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto us, the said Edward Bayzand Ellington and Joseph Liddell Anderson, Her special license that we, the said Edward Bayzand Ellington and Joseph Liddell Anderson, our executors, administrators, and assigns, or such others as we, the said Edward Bayzand Ellington and Joseph Liddell Anderson, our executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "**Improvements in Machinery for the Storing of Grain and Seed**," upon the condition (amongst others) that we, the said Edward Bayzand Ellington and Joseph Liddell Anderson, our executors or administrators, by an instrument in writing under our or their hands and seals, or under the hand and seal of one of us or them, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Edward Bayzand Ellington, on behalf of myself and the said Joseph Liddell Anderson, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, reference being had to the accompanying Sheet of Drawings, and to the figures and letters marked thereon, that is to say :—

This Invention has for its object improvements in the machinery employed in warehousing grain and seed in bulk, the grain being elevated by means of cranes, hoists, or other known appliances, and distributed over the warehouse by creepers or travelling carrying bands. At the point or points where the grain leaves the creepers or bands we place spouts mounted so that they can be made to revolve, into which the grain passes, and by swinging these spouts the grain is directed to any desired point.

We also employ similar spouts to distribute grain from the elevator on to any one of a number of creepers or bands radiating from the elevator. By combining two or more of such spouts, so that each will command all the creepers or bands, the grain can be taken from two or more points, generally elevators, and sent from either or all down to any one, two, or more of the creepers or bands.

The revolving spouts may also be so arranged as to receive the grain from one travelling band, and either to deliver it on to other travelling bands at a lower level which convey the grain to different parts of the warehouse, or by turning the spout it may be made to deliver the grain directly on to the floor or into shoots.

In cases where a travelling band is passed at one or more points over and under two guide rollers, situated the one below the other, so that different portions of the band are thereby at different levels, the said spouts may be placed so as to receive the grain from the part of the band at the higher level, and either to deliver it on to the part of the band at the lower level, or by turning the spout it may be made to deliver the grain on to other bands or creepers, or directly on to the floor or into shoots.

These revolving spouts may either be moved and set directly by hand, or they may be shifted by wire ropes, bands, or rods connected from them to levers mounted at a central point of the warehouse, so that an attendant at that point can by moving the levers alter the directions of the several spouts.

Description of the Drawings.

Fig. 1 represents a side view; and Fig. 2, a plan of a revolving spout constructed and applied according to this Invention for the purpose of transferring grain, seeds, or such like substances from one travelling band A to another travelling band B at a lower level.

The spout consists of an upper part C and a lower part D, both of which are brought to a cylindrical form at the neck where they meet, and mounted in a framing E, so that they can be turned therein on a vertical axis, either separately or together. It will be seen that when it is desired either to receive or to deliver the grain in a different direction either or both parts of the spout can be turned round to the desired attitude. The dotted lines D^1, in Figs. 1 and 2, show the lower part

turned so as to deliver into a spout or creeper F. Fig. 3 represents a side view of a spout similarly constructed, and applied for transferring the grain from one portion of a travelling band G to another portion of the same band conducted to a lower level by guide rollers *g*, *g*.

The spouts, as above described, may be turned to the desired direction either by hand or in the following manner:—Round the cylindrical neck of either or both of the parts of the spout is formed a groove for a band or cord H, which is passed round suitable guide pullies *h*, *h*, and conveyed to any convenient position. By pulling such bands or cords in the one direction or the other either part or both parts of the spout can be turned as required; and thus from one central point in a granary or warehouse the direction in which the grain is to be received or delivered at various distant points can be commanded.

Fig. 4 represents diagrammatically a plan of an arrangement of such spouts as have been above described in connection with several elevators, travelling bands, creepers, or fixed spouts. e^1, e^2, are elevators by which the grain is raised to the upper floor; and *c*, *c*, are a number of creepers, travelling bands, or delivery spouts for conveying the grain in different directions, as, for example, to millstones or store bins. By arranging these points of delivery circularly round revolving spouts s^1, s^2, such as have been described above, grain can be conveyed from either elevator to any of the points of delivery. For example the spout s^1 can be set so as to convey from the elevator e^1 to the point *d*, as shown in the Figure, or the lower part can be turned to such an attitude as is indicated by the dotted lines s^3, so as to deliver at d^1; and in like manner the spout s^2 can be made to convey grain from the elevator e^2 to d^2, d^3, or other points in the same circle. Again the upper part of the spout s^1 may be turned to e^3, as indicated by the dotted lines s^4, and the upper part of s^2 may be turned as s^5 to e^1, and thus either elevator can be placed in connection with any of the points of delivery.

Having thus described the nature of the said Invention, and in what manner the same is to be performed, we claim,—

First. The use of revolving spouts constructed and operating substantially in the manner and for the purposes herein described.

Second. The mode of turning revolving spouts, such as have been above referred to, by means of cords or bands, so that from one point in a

granary or warehouse the reception and delivery of grain, seeds, and the like at various distant points can be commanded, substantially as herein described.

Third. The arrangement of revolving spouts, such as have been above referred to, so as to bring into connection with one another the elevators, travelling bands, or other apparatus for conveying grain, seeds, and the like throughout a granary or warehouse, substantially as herein described in reference to Fig. 4.

In witness whereof, I, the said Edward Bayzand Ellington, have hereunto set my hand and seal, this Seventeenth day of April, in the year of our Lord One thousand eight hundred and seventy-three.

EDWARD BAYZAND ELLINGTON. (L.S.)

Hereford: Printed for His Majesty's Stationery Office, by The Hereford Times Ltd.
[Wt. 55—25/11/1920.]

(1 SHEET)

A.D. 1872. Oct. 22, No. 3107.

ELLINGTON & ANDERSON'S Specification.

(2nd Edition)

FIG. 1.

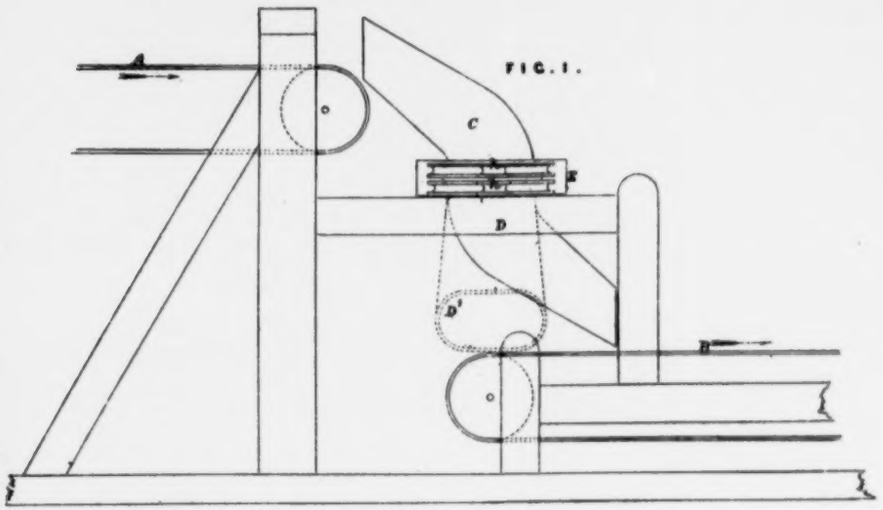


FIG. 3.

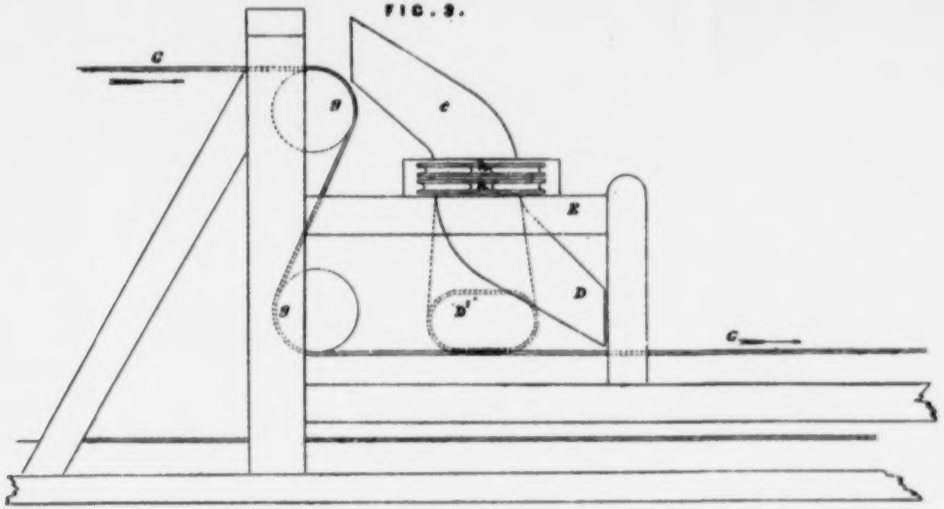


FIG. 2.

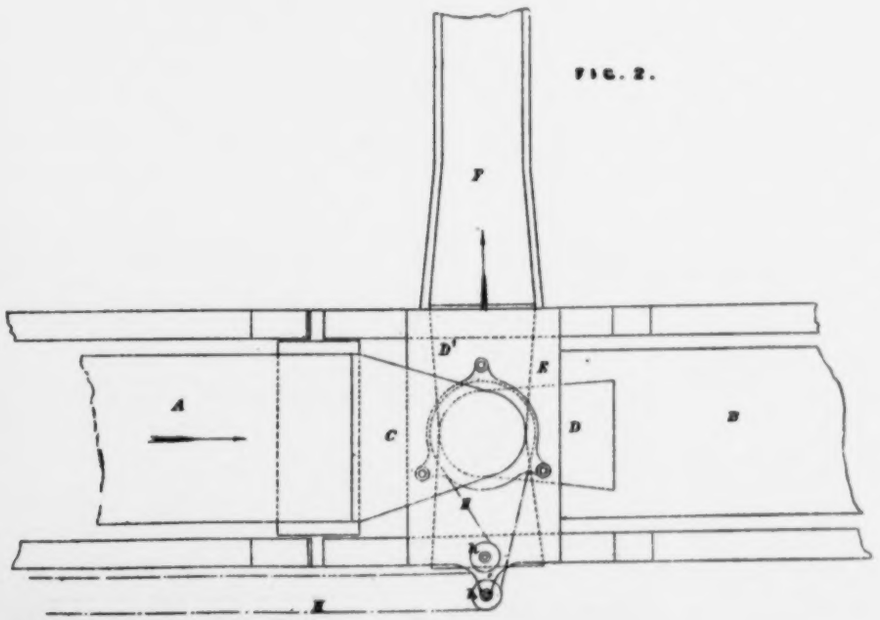
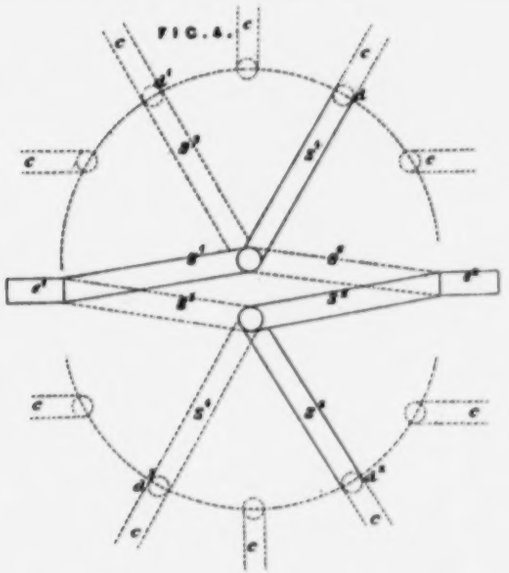


FIG. 4.



(Second Edition.)

A.D. 1880, 18th MAY. No 2017.

Apparatus for Elevating, Transferring, and Cleaning Grain.

LETTERS PATENT to John Henry Johnson, of 47, Lincoln's Inn Fields, in the County of Middlesex, Gentleman, for an Invention of "IMPROVEMENTS IN APPARATUS FOR ELEVATING, TRANSFERRING, AND CLEANING GRAIN." A communication from abroad by William Brown Reaney, of Baltimore, Maryland, and Clement Acton Griscom, of Philadelphia, Pennsylvania, both in the United States of America.

PROVISIONAL SPECIFICATION left by the said John Henry Johnson at the Office of the Commissioners of Patents on the 18th May 1880.

JOHN HENRY JOHNSON, of 47, Lincoln's Inn Fields, in the County of Middlesex, Gentleman. "IMPROVEMENTS IN APPARATUS FOR ELEVATING, TRANSFERRING, AND CLEANING GRAIN." A communication from abroad by William Brown Reaney, of Baltimore, Maryland, and Clement Acton Griscom, of Philadelphia, Pennsylvania, both in the United States of America.

This Invention, which relates to apparatus for elevating, transferring, and cleaning grain, is more especially applicable to the unloading of grain from large or small vessels, and transferring it to suitable houses, freight wagons, boats, or other receptacles, and cleaning the grain on its passage from the vessel to the receptacle.

In the following description the improvements are described as applied to a floating grain-elevating apparatus, but the apparatus may be erected on land or on wharves.

In carrying out this Invention the receiving elevator which is to raise the grain from the hold of the vessel to be unloaded is hinged at the outer end of a swinging arm pivoted to a frame which can be moved up or down on vertical guides on the framework of the apparatus.

When the apparatus is not in use this frame is lowered on its guides to the lower end of the framework, the opposite end of the arm being turned upwards, and the receiving elevator by the same movement is drawn within the framework of the apparatus.

When the apparatus is to be put in use the sliding frame to which the arm carrying the receiving elevator is pivoted is raised on the guides until the lower end of the receiving elevator can be swung over the rail of the vessel to be unloaded,

[Price 8d.]
PRICE 1/-

suitable hoisting ropes being provided. The receiving elevator, by the lowering of the rope and the swinging of the arm, is then lowered down the hatchway into the hold of the vessel to the depth necessary to permit the grain to flow steadily into the elevator case to be elevated by the travelling buckets to the top of the case. The raising and lowering of the slide, the swinging arm, and receiving elevator is accomplished by means of suitable hoisting ropes of wire or other material passing over pulleys at the upper end of the framework down to a drum or drums at the lower end, connected by clutch devices to the main driving shaft.

From the top of the receiving elevator the grain flows through pipes to a shifting spout. One of these pipes is hinged to the receiving elevator so as to accommodate itself to the position of the latter. This pipe has a sleeve on the outside which is hinged to slide blocks at the upper end of the spout, so that when the swinging arm and receiving elevator are raised, and the pipe has been thereby withdrawn from the other pipe, the slide blocks will move in vertical guides in the framework immediately over the spout, and consequently when the elevator case and swinging arm are lowered again into position the one pipe will slide back into proper position with the other pipe.

Immediately below the shifting spout are two weighing hoppers, so that when one hopper is filled with grain the spout is turned to fill the other. The full weighing-hopper is then emptied by allowing the grain to flow into the hopper, from which it is elevated by a second elevator, and delivered from the upper end of the latter through a suitable spout and spreader into the cleaning apparatus, which will be hereinafter described. From the cleaning apparatus the grain passes through a spout to a hopper, from which it is elevated by a third elevator, and delivered from the top of the latter through a spout to the necessary receptacle for transportation or storage.

Each of the three elevators is constructed in the usual manner of a closed case containing an endless belt carrying the usual elevating buckets, and passing over pulleys at the top and bottom of the case. The spindle of the pulley at the upper end of each case passes to the outside, and is provided with a pulley for the driving belt. The upper pulleys of the two elevators secondly mentioned may be mounted on the same shaft, in which case only one driving pulley will be necessary for both elevators, this pulley being driven by a suitable belt from a pulley on the driving shaft. The shaft at the upper end of the receiving elevator is provided with two driving pulleys, over which pass driving belts passing round a pulley at the point where the swinging arm is pivoted to the sliding frame. This latter pulley driven by a belt passes over an idler pulley at the top, and over a driving pulley near the bottom of the apparatus, and round a combination of pulleys at the point where the swinging arm is pivoted to the sliding frame.

The cleaner above referred to is provided at the top with the spreader, as has been described, and below the latter is a shaking screen through which the grain passes, while the cobs and the like pass into a box at the end. The grain from the screen falls into an inclined tray, which directs it to a passage and hopper leading to the delivery pipe or spout above described. A fan communicating with the cleaning chamber draws air through the grain as it descends through the passage. The heavy dust exhausted from the grain falls into a chamber, while the lighter particles are carried with the air current through the fan and discharged outside the apparatus. The current of air is regulated by a valve arranged at any suitable point.

The cleaning apparatus above described may however be dispensed with, in which case the second hopper and the third elevator will no longer be required, and the grain can be discharged into the necessary receptacle for storage or transportation by the second elevator, or even in some cases the grain may be directly discharged from the receiving elevator through its delivery spout to the desired receptacle.

SPECIFICATION in pursuance of the conditions of the Letters Patent filed by by the said John Henry Johnson in the Great Seal Patent Office on the 18th November 1880.

JOHN HENRY JOHNSON, of 47, Lincoln's Inn Fields, in the County of Middlesex, Gentleman. "IMPROVEMENTS IN APPARATUS FOR ELEVATING, TRANSFERRING, AND CLEANING GRAIN." A communication from abroad by William Brown Reaney, of Baltimore, Maryland, and Clement Acton Griscom, of Philadelphia, Pennsylvania, both in the United States America.

The said Invention, which relates to apparatus for elevating, transferring, and cleaning grain, is more especially applicable to the unloading of grain from large or small vessels, and transferring it to suitable houses, freight wagons, boats, or other receptacles, and cleaning the grain on its passage from the vessel to the receptacle.

In the following description the Invention is described as applied to a floating grain elevating apparatus, but the apparatus may be erected on land or on wharves.

In the accompanying Drawings,—

Figure 1 (Sheet 1) is a view shewing a transverse section of the vessel to be unloaded and of the floating grain elevator alongside.

Figure 2 (Sheet 2) is a side or face view of the floating grain elevator, shewing the interior parts in dotted lines.

Figures 3, 4, and 5 are detached sectional views of the cleaning apparatus.

The receiving elevator A, which is to raise the grain from the hold of the vessel H¹ to be unloaded, is hinged at the outer end of a swinging arm G pivoted to a frame N², which can be moved up or down on vertical guides on the framework of the apparatus.

When the apparatus is not in use this frame is lowered on its guides to the lower end of the frame work to the position N¹ (Figure 1), the arm G being swung up to the position shewn by dotted lines at G¹, and the receiving elevator A by the same movement drawn within the framework of the grain boat or house to the position shewn by dotted lines at A¹.

When the apparatus is to be put in use the sliding frame, to which the arm G carrying the receiving elevator A is pivoted, is raised on the guides by hoisting ropes, as hereinafter described, until the lower end of the receiving elevator can be swung over the rail of the vessel to be unloaded, as shewn by the dotted lines A², G², the position of the hoisting rope or ropes for raising the outer end of the arm being indicated at E². The receiving elevator, by the lowering of the rope E² (E¹), and the consequent swinging of the arm G, is then lowered down the hatchway K¹ into the hold of the vessel to the depth necessary to permit the grain to flow steadily into the elevator case to be elevated by the travelling buckets to the top of the case. The raising and lowering of the sliding frame N², the swinging arm, and receiving elevator is accomplished by means of suitable hoisting ropes E¹, (E²), and F², F², of wire or other material, passing over pulleys at the upper end of the framework down to a drum or drums at the lower end, connected by clutch devices to the main driving shaft L¹ (Figure 2).

From the top of the receiving elevator A the grain flows through the pipes B and C to the shifting spout D (Figure 1). The pipe B is hinged at U¹ to the receiving elevator A, so as to accommodate itself to the position of the latter. The pipe B has a sleeve on the outside, which is hinged to slide blocks at the upper

end of the spout D, so that when the swinging arm and receiving elevator A are raised, and the pipe B has been thereby withdrawn from the pipes C, the slide-blocks will move in vertical guides V^1 (Figure 1) in the framework, immediately over the spout D, and consequently when the elevator case and swinging arm are lowered again into position the pipe B will slide back into proper position with respect to the pipe C.

Immediately below the shifting spout D are two weighing hoppers E, E, so that when one hopper is filled with grain the spout D is turned to fill the other. The full weighing hopper is then emptied by allowing the grain to flow into the hopper F, from which it is elevated by a second elevator F^1, and delivered from the upper end of the latter through a suitable spout H and spreader K into the cleaning apparatus L (Figures 2 and 3), which will be hereinafter described. From the cleaning apparatus the grain passes through a spout M (Figure 2) to a hopper N, from which it is elevated by a third elevator P, and delivered from the top of the latter through a spout Q (Figure 1) to the necessary receptacle for transportation or storage.

Each of the three elevators A, F^1, and P is constructed in the usual manner of a closed case containing an endless belt carrying the usual elevating buckets, and passing over pulleys at the top and bottom of the case. The spindle of the pulley at the upper end of each case passes to the outside, and is provided with a pulley for the driving belt. The upper pulleys of the elevator F^1 and P may be mounted on the same shaft T^1, in which case only one driving pulley S^1 (Figure 2) will be necessary for both elevators, this pulley S^1 being driven by a suitable belt from a pulley R^1 on the driving shaft L^1. The shaft at the upper end of the receiving elevator is provided with two driving pulleys Q^1, over which pass driving belts passing round a pulley at the point where the swinging arm G is pivoted to the sliding frame N^2. This latter pulley is driven by a belt passing over it and under guide pulleys *n*, above and below it (Figure 1), and round an idler pulley P^1 at the top, and over a driving pulley M^1 near the bottom of the apparatus.

The cleaner L above referred to is provided at the top with the spreader K, as has been described and as shown in Figures 3 and 4.

This spreader is provided with a regulating valve B^2 hinged at B^1, and below the spreader is a shaking screen R, through which the grain passes, while the cobs and the like pass into a box S (Figure 3) at the end. The grain from the screen falls into an inclined tray T, which directs it to a passage U and hopper V leading to the delivery pipe or spout M above described. A fan W communicating with the cleaning chamber draws air through the grain as it descends through the passage U, as indicated by the arrows *x*. The heavy dust exhausted from the grain falls into a chamber C^1, while the lighter particles are carried with the air current through the fan and discharged outside the apparatus, as indicated by the arrows *y*. The current of air is regulated by a valve D^1 arranged at any suitable point.

The cleaning apparatus above described may however be dispensed with, in which case the second hopper N and the third elevator P will no longer be required, and the grain can be discharged into the necessary receptacle for storage or transportation by the second elevator, or even in some cases the grain may be directly discharged from the receiving elevator through its delivery spout to the desired receptacle.

Having now described and particularly ascertained the nature of the said Invention, and the manner in which the same is or may be used or carried into effect, I would observe in conclusion that what I consider to be novel and original, and therefore claim as the as the Invention secured to me by the hereinbefore in part recited Letters Patent is,—

First. The combination of the receiving elevator with the swinging arm and vertically sliding frame and hoisting ropes, by which the receiving elevator may be

readily introduced into and withdrawn from the holds of vessels of any size, substantially as hereinbefore described.

Second. The general construction, arrangement, and combination of parts constituting an apparatus for elevating, transferring, and cleaning grain, substantially as hereinbefore described and illustrated in the accompanying Drawings.

In witness whereof, I, the said John Henry Johnson, have to this my Specification set my hand and seal, this Eighteenth day of November, One thousand eight hundred and eighty.

J. HENRY JOHNSON. (L.S.)

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.

[C. 9695—25—11·1906.]

BLUEPRINT
TOO
LARGE
FOR
FILMING

COMPLETE SPECIFICATION

[fol. 573] A. D. 1888.—No. 10,380

Improved Method and Apparatus for Coaling Ships from Floats or Barges

I, Robert Baillie, of London Yard, Isle of Dogs, in the County of Middlesex, Civil Engineer, do hereby declare the nature of this Invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

My invention relates to an improved method and apparatus for coaling ships from floats, or barges, wherein the coals are conveyed from the float or barge to the ship by means of an arrangement of chain buckets and shoots, constructed and operating as follows.

Upon the coaling float is arranged a staging upright, or mast of suitable height carrying at its upper end a crosshead capable of controlled vertical travel, which crosshead carries a shaft, or shafts on which is or are hinged a boom or booms having pullies or sprocket wheels at each end over which run endless chains or wire ropes carrying buckets.

These booms rest with bearing rollers or wheels on their lower ends either upon the surface of the coals in the float, or upon the weather deck therof or over the ceiling in the bottom of the hold, or on any other convenient surface, so that the coals are either gripped by the travelling chain buckets or are fed into them.

The crosshead carrying the upper ends of the booms as also the upper framework on which it is mounted is adapted to be raised and lowered by screws or other mechanical appliances which are worked by small steam engines placed conveniently either above or below the weatherdeck, which may also serve to drive the shafts on the crosshead by which the travelling motion is imparted to the chain buckets. Thus according to the height to which the crosshead is adjusted, the lower ends of the boom may either be situated at a point close alongside of the staging, upright or mast, or they may be made to extend any desired distance therefrom, according to the point of the float from which it is desired to take the coals, and by gradually raising or lowering the crosshead either while the chain buckets are at work or while they are not in operation the lower ends of the booms may be made to travel gradually along the surface on which they rest. The upper part of the staging, uprights or masts may conveniently be made to slide telescopically in the lower part, and be provided with suitable locking gear for holding the staging &c. in whatever position it is raised or lowered to, such locking gear being controlled from the weather deck, and the raising and lowering of the crosshead &c. may be effected by means of the gear thereon that drives the chain buckets or by independent gear.

The coal raised by the chain buckets to the crosshead is there delivered into a hopper also carried by the crosshead, to which are

jointed shoots through which the coal is conveyed to the coal bunkers of the ship to be coaled. These shoots may either be fixed or, by preference, they are made with hinge joints so as to be capable of both horizontal and vertical motion, and they may have hinged [fol. 574] spouts or funnels at their outer ends for the convenient delivery of the coal into any bunker or other place intended for its reception.

The before mentioned engines for working the coaling apparatus may either be supplied with steam from special donkey boilers or steam from the main boilers of the float or barge (when this is propelled by steam power) may be supplied to these engines through pipes, and the exhaust steam may also be conveyed by pipes to the condenser of the ship's engines, the condenser being kept in active condition by the ordinary engine-room donkey pump.

In order that my above described invention may be readily understood I will proceed to describe by way of example the arrangement for carrying the same into effect shewn on the accompanying drawings, in which Fig. 1 shows a side view of part of a coaling float, with the coaling apparatus in the elevated position, ready to discharge coal; Fig. 2 is a transverse section showing the same position of the apparatus, Fig. 3 is a side elevation showing the coaling apparatus lowered in sea going trim, Fig. 4 is an end elevation of the coaling float, also with the apparatus in the lowered position, Fig. 5 is a plan shewing the space occupied by the coaling apparatus on the weather deck when in sea going trim.

The same letters of reference indicate the same parts in each of the figures.

The staging for the coaling apparatus consists firstly of the lower standards or masts A, which are fixed on deck and braced diagonally so as to form a rigid structure and secondly the upper part consisting of standards or masts B B framed together at top, that slide telescopically in the lower ones A and which carry at top the crosshead C, such upper part and crosshead being raised or lowered by elevating screws attached to the crosshead C and driven from below deck by engines in the engine room D.

The standards B are locked in the position to which they are adjusted, by locking bolts E E which are shot in position by small levers from the deck and attached to the lower part A. When the standards are locked in position the wire rope guys F are tightened up and belayed, thus rendering the structure sufficiently rigid.

The crosshead C carries the hopper G forming part thereof and which receives the coal from the chain buckets and conveys the same to the coaling shoots being provided internally with a hinged flap adjustable to an angle to either side, so as to guide the descending coals either to the port or the starboard shoot as required.

To the shoot G are attached the telescopic coal shoots H H which are arranged to swivel in a horizontal direction on pivots at I I Fig. 2 attached to the crosshead C and they have also a hinge joint at K whereby they are enabled to swivel also in a vertical direction; the shoots have also pivoted spouts or funnels L L at their outer

ends and they are guyed into any desired position for dropping these spouts into the bunker holes or hatches of the vessel to be coaled, as indicated by the full and dotted lines at Fig. 2, the latter shewing the extreme extended position of the shoots and spouts M M are the booms, which are hinged on the shafts N carried in bearings on the crosshead C and having fixed thereon sprocket wheels over which pass the endless chains or wire ropes carrying the steel plate buckets P, P, and passing over other sprocket wheels on shafts at the lower ends of the booms, which also carry bearing wheels O O by means of which the booms rest upon the surface, thus allowing these ends to travel easily along, as the crosshead C is raised or lowered, to the most convenient position for the buckets to pick up the coal. The dotted positions shewn in Fig. 1 shew the extreme positions of the booms when discharging the coal, these positions being given by the same screw or other gear that raises or lowers the upper standards B B.

When these standards are locked in position and guyed the crosshead is free and can be lowered or elevated to any position on the standards that is most convenient for working the cargo.

The chain buckets are worked by means of suitable toothed gearing driving spur or bevil wheels on the ends of the shafts N, and receiving motion from the engines at D through a vertical shaft attached at the upper end of the crosshead C or in any other convenient manner.

[fols. 575 & 576] It will be seen from the foregoing description that the mechanism for raising and lowering the crosshead with coal shoots booms and chain buckets is quite independent of the gear actuating the sprocket wheels and buckets, so that the one motion may be effected independently of the other, or they may both be effected simultaneously at the will of the person in charge of the work.

The small engines for working the above described apparatus are as before stated placed below deck and may be supplied with steam from the main boilers S of the float and the exhaust steam is led to the condenser of the float's engines: this arrangement has the advantage of dispensing with donkey boilers and of keeping the main boilers in their normal working condition with regard to water. If desired however or where the float or barge is not propelled by steam special donkey boilers may be provided for working the coaling engines.

Having now particularly described and ascertained the nature of this said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. The herein described method of coaling ships from floats or barges whereby the coal is raised from the float to an elevated discharge by means of endless chain buckets carried by supports or booms whose upper ends are arranged to move vertically up or down so as to bring the lower ends to any point of the coaling float from which it is desired to take the coal.

2. Apparatus for coaling ships from floats or barges wherein booms carrying endless chain buckets are hinged at their upper ends to an

elevated crosshead on a staging, unright or mast which crosshead can be raised or lowered so as to bring the lower ends of the booms to any point from which it is desired to take the coal a hopper being provided on the crosshead for receiving the coal from the chain buckets and for delivering the same to pivotted shoots for conveying the coal to the ship, substantially as herein described.

3. Apparatus for coaling ships from floats or barges combined and operating substantially as herein described with reference to the drawings.

Dated this 16th day of April, 1889.

Abel & Imray, Agents for the Applicant.

London: Printed for Her Majesty's Stationery Office by Darling and Son, Ltd. 1889.

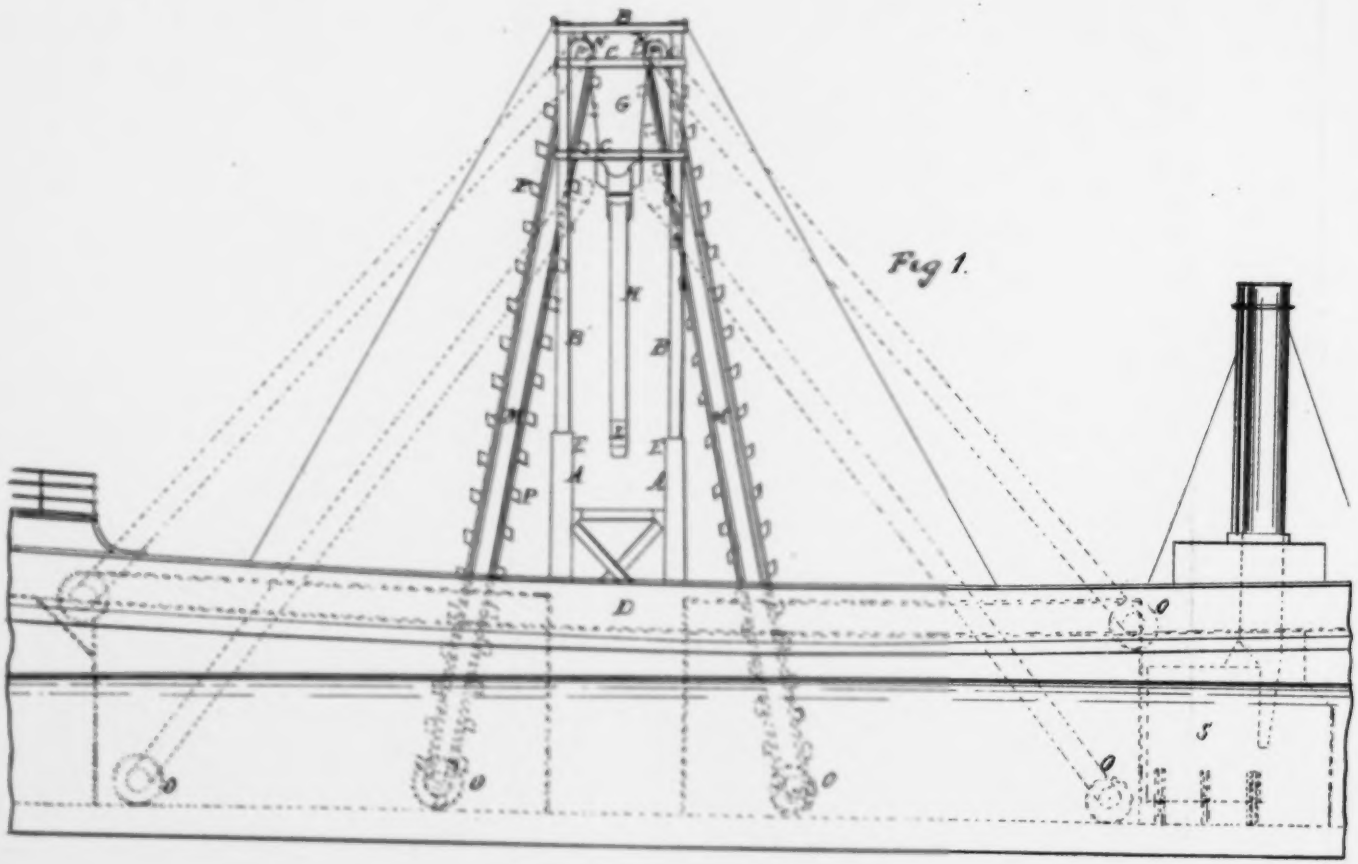


Fig 1.

[This Drawing is a reproduction of the Original on a reduced scale.]

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Fig 2

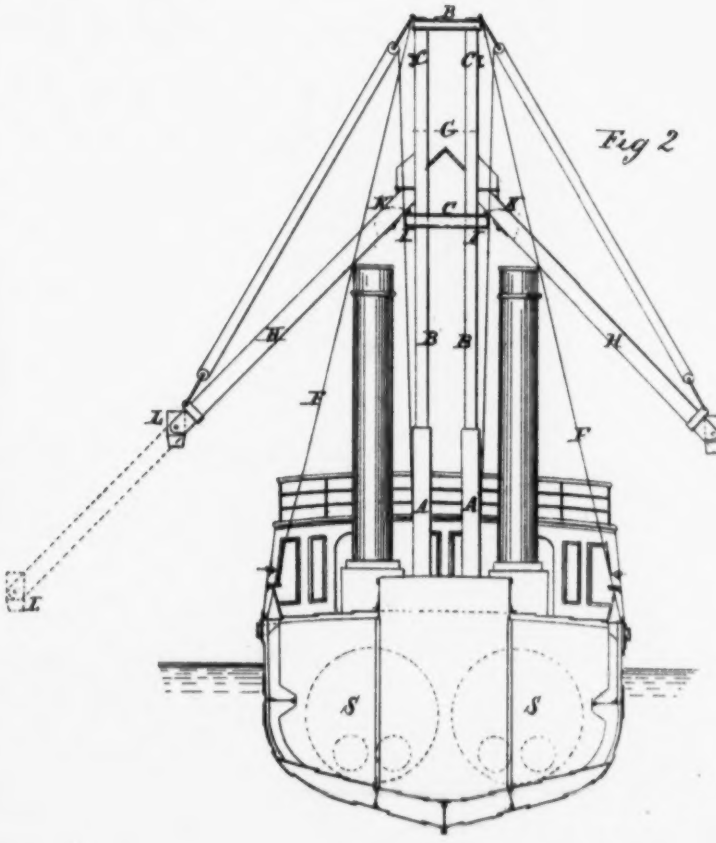
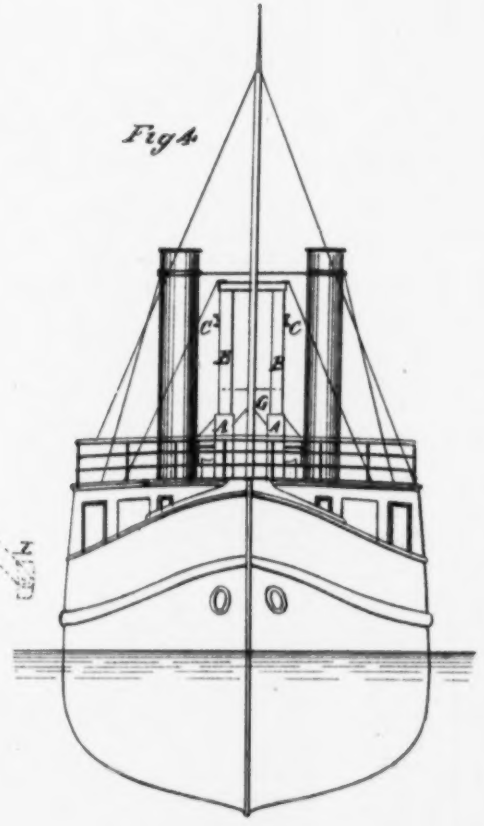


Fig 4



(This Drawing is a reproduction of the Original on a reduced scale.)

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[Second Edition.]

N° 16,525 A.D. 1895

Date of Application, 3rd Sept., 1895
Complete Specification Left, 3rd July, 1896—Accepted, 3rd Dec., 1896

PROVISIONAL SPECIFICATION.

Improvements in Apparatus for Shipping or Transferring Coal and other Materials

I, JOHN PEARCE ROE, of 150 Leadenhall Street, in the City of London, Engineer, do hereby declare the nature of this invention to be as follows :—

This invention has for object to enable coal and other material to be shipped or transferred from one place to another in a rapid and continuous manner with the minimum of labour, and breakage of material.

For this purpose the coal or other material (hereinafter referred to as material) is discharged from waggons or other suitable receptacles into a hopper or receiver from the bottom of which it is discharged onto an endless travelling band, hereinafter called the delivery band, by which the material is carried to a point whence it can be discharged into the hold of a ship or other place. The capacity of the hopper may advantageously be such that the variation in the level of the material, due to its withdrawal from below during the short intervals between the discharge of successive waggons, will be small, so as to thereby reduce the breakage of the material to a minimum.

The rate of discharge from the bottom of the hopper is regulated by suitable means which also serve to convey the material from the bottom of the hopper to the delivery band. For this purpose an inclined shoot in one or more sections may be used, arranged at the hopper nose and having a jig motion that may be adjustable so as to regulate discharge according to requirements. Or in lieu of a shoot, an endless travelling band (hereinafter called for distinction the feeding band) may be used, arranged at the bottom of the hopper in such a manner as to practically form an extension of the hopper bottom.

When a band is used, it may be arranged to work beneath extensions of the hopper sides, and is preferably provided with sides embracing the lower edges of the said hopper extensions so as to prevent escape of small material between such extensions and the band. Or the band may be arranged to pass through an opening in the lower portion of the hopper so as to pass over the hopper bottom and between the extensions of the hopper sides. The feeding band may have a non perforated bottom, or the said band and the hopper bottom may be formed with openings. When a jig shoot is used, the sides thereof form lateral extensions of the hopper. The arrangement in either case may be such that the jig shoot or feeding band when at rest, forms a toe of sufficient length to prevent any flow of material from the hopper, and when it or they is or are set in motion, the withdrawal of material will be proportionate to the speed of the shoot or band and to the cross sectional area of the opening in the hopper the feeding device when in motion withdrawing material of small and large size indiscriminately at a regular given rate that can be varied at will to suit requirement by adjusting the motion of the said feeding device.

In some cases the jig shoot, or the feeding band, may be provided with a pivoted flap or part adapted to form a stop when the motion of the shoot or feeding band ceases.

As the jig shoot or feeding band would have a depth of material upon it corresponding roughly to the height of the opening in the bottom of the hopper,

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its speed would be usually comparatively moderate, and to continue the movement of material forward, the jig shoot or shoots, or feeding band, is arranged to deliver onto another band (herein called the delivery band) that may advantageously run at a greater velocity and have therefore a reduced thickness of material upon it. By this means owing to the thickness of material upon the delivery band being moderate, the structural scantlings for carrying this band can be proportionately light, thereby enabling the band to be readily adjusted or moved to adapt it to various applications where this power of adjustment would be advantageous, as for example in shipping coal, where it is of importance to be able to move the outer end of the delivery band to various positions over a vessel's hatchways and to provide for differences in level.

The angular or radial adjustment of the delivery band, can be effected in various ways.

In one arrangement the delivery band is pivoted at its inner end for vertical movement, and to permit of horizontal movement, the hopper may turn bodily, or it may be made in two parts that are circular in plan at the line of junction and the lower of which together with the feeding and delivery bands is made to turn horizontally as upon a centre or roller path, the centre of motion in each case corresponding to the centre of the circular portion of the hopper. This arrangement admits of an increased radius for horizontal swing, and of a simple construction of driving mechanism for the delivery band, besides keeping the feeding and delivery bands always in line.

The inner end of the delivery band may also be mounted on a carriage or slide or be otherwise so supported as to enable the band to be run in and out so as to serve for example a wide hatch and permit of its being housed. In this arrangement the part of the delivery band that would receive the material from the feeding device may be made to move through a straight or curved path beneath the feeding device in which case the girders carrying the outer portion of the band would be pivoted or jointed to those carrying the inner portion so as to allow for vertical radial movement.

The girders supporting the delivery band are or may be partly suspended or supported from a structure by suitable connections operated by hydraulic or other mechanism for effecting and permitting the horizontal and vertical adjustments of the band.

The apparatus hereinbefore described, may be mounted on a frame having radial movement over a quay wall. Or it may also be carried by a frame or structure mounted on ways parallel with a quay wall. An auxiliary frame supported by and having radial movement upon the main frame may in some cases advantageously be employed for carrying the hydraulic or other mechanism used for effecting the vertical and horizontal radial movements of the delivery band girders. The main or auxiliary frame may also carry other appliances for suspending or handling suitable devices such as hereinafter described, for distributing the material supplied by the delivery band.

To admit of a number of waggons being quickly discharged one after another into the main hopper, and thereby to avoid the loss of time involved when each empty waggon has to be moved back to a crossing at the rear of the tip, the entering and leaving tracks may be so arranged in relation to tipping apparatus that each waggon can be quickly moved from the one track to the other along a connecting length of track, or crossing, located in front of the tip, or be conveyed from one track to the other by a suitable traverser similarly located, the arrangement in each case being such as to admit of a waggon after being dumped passing on in the same direction so as to admit of the next waggon to be dumped following immediately in the rear of the first one.

In one arrangement suitable for use where the waggons are to be dumped, there is an oscillating cradle to receive and tip each waggon in succession. The cradle may be operated either by mechanical power, or by gravity. Movable stops or buffers are provided against which each waggon takes when in position

for tipping, the said stops or buffers being so constructed and arranged as to swing or otherwise move clear of the waggon to permit of its being passed forward when emptied. After being tipped each waggon may move onward to reverse points.

For low level tracks an elevator and drop may be provided whereby the waggons can be lifted at one end of the tip and lowered at the other end thereof after being dumped. The tracks may be arranged either parallel with, or at an angle to the quay wall, and the elevator and drop may be arranged to turn through any desired number of degrees during ascent and descent when the lower tracks do not run in line with those at the higher level. When hopper bottom or other type of self dumping waggons are used, the tip cradle is dispensed with.

Where a hopper, and the other devices hereinbefore described are carried by a movable frame or structure, the tipping or dumping apparatus and traverser, or reverse points, or the elevator and drop, as the case may be, can be mounted on the said main frame or structure so that the whole can be moved together.

Various means may be provided for conducting or distributing the stream of material in any desired direction and to any desired place after it leaves the end of the delivery band. For this purpose a curved or other shaped shoot or guide may be used, hinged or pivoted in such a manner as to admit of vertical adjustment, by any suitable means.

The shoot or guide may be of various shapes.

For distributing or trimming coal or other material, as for example in the hold of a ship, I provide in connection with apparatus adapted to supply a continuous stream of material, mechanical trimming devices that may be suspended from points outside the ship's hold, so as to be capable of being readily inserted into manœuvred within and withdrawn from the ship's hold and are so constructed and arranged that the material can be delivered fore and aft and athwart ship in such a manner as to avoid impact and breakage as far as possible. Where the place to which the material is to be delivered is such that the force of gravity will be sufficient to cause the delivery of the material to the required place, the trimming device may be in the form of a curved shoot the entry end of which may be approximately vertical whilst the lower portion is curved in a lateral direction, and may be of such a shape as to considerably reduce the velocity of the material before it finally leaves the shoot. The said shoot may be made in two or more sections capable of moving one over or within the other.

According to another arrangement the trimming device comprises one or more endless conveying devices driven where necessary by a self contained motor, and arranged to pass over drums carried by light girders or other supports which may be telescopically mounted in relation to other girders or supports, the whole being suspended so that it can be conveniently adjusted to suitable heights and positions and the arrangement being such that material delivered upon the receiving end of the conveying device will be carried forward and delivered where required. The conveying device in this arrangement may be in the form of a band adapted to carry the material, or it may consist of ropes or chains connected by transverse parts adapted to cause the material to travel over a relatively fixed surface. Where two or more conveying devices are used they may be driven at different velocities.

In another arrangement the trimming device comprises a shoot and band the one being arranged to deliver by gravity onto the other which carries the material forward and delivers it at the required place, the whole being suitably suspended as before and the band being driven, where necessary, by a self contained motor, and being capable when desirable of movement relatively to the shoot so that the length of the said device can be varied to suit different requirements. The shoot and band may in some cases be so constructed and arranged that the material

its speed would be usually comparatively moderate, and to continue the movement of material forward, the jig shoot or shoots, or feeding band, is arranged to deliver onto another band (herein called the delivery band) that may advantageously run at a greater velocity and have therefore a reduced thickness of material upon it. By this means owing to the thickness of material upon the delivery band being moderate, the structural scantlings for carrying this band can be proportionately light, thereby enabling the band to be readily adjusted or moved to adapt it to various applications where this power of adjustment would be advantageous, as for example in shipping coal, where it is of importance to be able to move the outer end of the delivery band to various positions over a vessel's hatchways and to provide for differences in level.

The angular or radial adjustment of the delivery band, can be effected in various ways.

In one arrangement the delivery band is pivoted at its inner end for vertical movement, and to permit of horizontal movement, the hopper may turn bodily, or it may be made in two parts that are circular in plan at the line of junction and the lower of which together with the feeding and delivery bands is made to turn horizontally as upon a centre or roller path, the centre of motion in each case corresponding to the centre of the circular portion of the hopper. This arrangement admits of an increased radius for horizontal swing, and of a simple construction of driving mechanism for the delivery band, besides keeping the feeding and delivery bands always in line.

The inner end of the delivery band may also be mounted on a carriage or slide or be otherwise so supported as to enable the band to be run in and out so as to serve for example a wide hatch and permit of its being housed. In this arrangement the part of the delivery band that would receive the material from the feeding device may be made to move through a straight or curved path beneath the feeding device in which case the girders carrying the outer portion of the band would be pivoted or jointed to those carrying the inner portion so as to allow for vertical radial movement.

The girders supporting the delivery band are or may be partly suspended or supported from a structure by suitable connections operated by hydraulic or other mechanism for effecting and permitting the horizontal and vertical adjustments of the band.

The apparatus hereinbefore described, may be mounted on a frame having radial movement over a quay wall. Or it may also be carried by a frame or structure mounted on ways parallel with a quay wall. An auxiliary frame supported by and having radial movement upon the main frame may in some cases advantageously be employed for carrying the hydraulic or other mechanism used for effecting the vertical and horizontal radial movements of the delivery band girders. The main or auxiliary frame may also carry other appliances for suspending or handling suitable devices such as hereinafter described, for distributing the material supplied by the delivery band.

To admit of a number of waggons being quickly discharged one after another into the main hopper, and thereby to avoid the loss of time involved when each empty waggon has to be moved back to a crossing at the rear of the tip, the entering and leaving tracks may be so arranged in relation to tipping apparatus that each waggon can be quickly moved from the one track to the other along a connecting length of track, or crossing, located in front of the tip, or be conveyed from one track to the other by a suitable traverser similarly located, the arrangement in each case being such as to admit of a waggon after being dumped passing on in the same direction so as to admit of the next waggon to be dumped following immediately in the rear of the first one.

In one arrangement suitable for use where the waggons are to be dumped, there is an oscillating cradle to receive and tip each waggon in succession. The cradle may be operated either by mechanical power, or by gravity. Movable stops or buffers are provided against which each waggon takes when in position

for tipping, the said stops or buffers being so constructed and arranged as to swing or otherwise move clear of the waggon to permit of its being passed forward when emptied. After being tipped each waggon may move onward to reverse points.

For low level tracks an elevator and drop may be provided whereby the waggons can be lifted at one end of the tip and lowered at the other end thereof after being dumped. The tracks may be arranged either parallel with, or at an angle to the quay wall, and the elevator and drop may be arranged to turn through any desired number of degrees during ascent and descent when the lower tracks do not run in line with those at the higher level. When hopper bottom or other type of self dumping waggons are used, the tip cradle is dispensed with.

Where a hopper, and the other devices hereinbefore described are carried by a movable frame or structure, the tipping or dumping apparatus and traverser, or reverse points, or the elevator and drop, as the case may be, can be mounted on the said main frame or structure so that the whole can be moved together.

Various means may be provided for conducting or distributing the stream of material in any desired direction and to any desired place after it leaves the end of the delivery band. For this purpose a curved or other shaped shoot or guide may be used, hinged or pivoted in such a manner as to admit of vertical adjustment, by any suitable means.

The shoot or guide may be of various shapes.

For distributing or trimming coal or other material, as for example in the hold of a ship, I provide in connection with apparatus adapted to supply a continuous stream of material, mechanical trimming devices that may be suspended from points outside the ship's hold, so as to be capable of being readily inserted into manœuvred within and withdrawn from the ship's hold and are so constructed and arranged that the material can be delivered fore and aft and athwart ship in such a manner as to avoid impact and breakage as far as possible. Where the place to which the material is to be delivered is such that the force of gravity will be sufficient to cause the delivery of the material to the required place, the trimming device may be in the form of a curved shoot the entry end of which may be approximately vertical whilst the lower portion is curved in a lateral direction, and may be of such a shape as to considerably reduce the velocity of the material before it finally leaves the shoot. The said shoot may be made in two or more sections capable of moving one over or within the other.

According to another arrangement the trimming device comprises one or more endless conveying devices driven where necessary by a self contained motor, and arranged to pass over drums carried by light girders or other supports which may be telescopically mounted in relation to other girders or supports, the whole being suspended so that it can be conveniently adjusted to suitable heights and positions and the arrangement being such that material delivered upon the receiving end of the conveying device will be carried forward and delivered where required. The conveying device in this arrangement may be in the form of a band adapted to carry the material, or it may consist of ropes or chains connected by transverse parts adapted to cause the material to travel over a relatively fixed surface. Where two or more conveying devices are used they may be driven at different velocities.

In another arrangement the trimming device comprises a shoot and band the one being arranged to deliver by gravity onto the other which carries the material forward and delivers it at the required place, the whole being suitably suspended as before and the band being driven, where necessary, by a self contained motor, and being capable when desirable of movement relatively to the shoot so that the length of the said device can be varied to suit different requirements. The shoot and band may in some cases be so constructed and arranged that the material

would be allowed to accumulate in the shoot from the lower end of which it would be withdrawn in a regular manner by the band.

The shoots when used alone or in conjunction with a band or bands may be made of a sinuous, zig-zag or other form in side view so as to occupy a comparatively short space horizontally, and exert a retarding action on material passing through them.

Where the velocity of the material would be high in trimming apparatus of the kind hereinbefore mentioned, the discharging end of the apparatus may be so formed as to retard the velocity of the material. To permit of this being done without choking, the material is caused to spread and deliver itself over an increased area.

For this purpose there may be provided at the delivery end of the shoot or band, a retarding and distributing device consisting of a plate the upper surface of which is so shaped as to spread the material delivered upon it and cause it, or some of it, to escape laterally. In some cases this plate, or parts thereof, may be made capable of adjustment relatively to the shoot or band so as to enable the extent of retarding action, or direction of distribution, or both, to be varied.

Where a simple or telescopically arranged shoot is used, its delivery end may be suitably shaped to act as a retarder and distributor in the manner described.

Trimming devices such as hereinbefore described may be flexibly or otherwise connected to an arm or support that is so pivoted to the shoot jointed to the discharging end of the delivery band, that it can turn about a vertical axis. Or the said trimming devices may be suitably connected to a ring supported by and having a circular movement round the shoot nose. To reduce friction, the said ring may work on balls or rollers running in or on a suitable path on the shoot. The arrangement in each case is such that the trimming device can be turned horizontally as required and so that it can if desired be raised and lowered.

In each case the supply hopper may be constructed with a double nose to serve two sets of feeding devices.

The endless bands used in apparatus of the kind hereinbefore described are carried by girders or supports which may be so formed as to impart any desired curvature to the bands; or supporting rollers, or sheaves arranged at intervals may be used for this purpose. Or the bands may carry rollers arranged to run along ways on the girders. A suitable tension may be imparted to the bands either by tension pulleys, or by so forming the girders or supports that a portion of each band will be unsupported from below so that such portion is free to sag and thus exert a tension on the whole band.

Where the fall or inclination of the endless conveying devices in apparatus of the kind herein described is such as to cause the said devices to move under the action of the load carried thereby, a suitable brake is or may be provided to regulate the velocity.

The apparatus hereinbefore described is especially applicable to loading ships for converting the intermittent supply of material produced by tipping or dumping into a continuous flow or stream of material of moderate dimensions, which can be conveniently conducted to and trimmed or stowed for example in a ship's hold with a rapidity and saving of labour that is not possible where large bulks are discharged at intervals direct into the ship.

The apparatus can be adapted in the main or in part to be worked in conjunction with a pontoon or float for the purpose of conveying material from one vessel or lighter to another, or to the shore; also for conveying or transporting material in mining or other works.

Dated this 3rd day of September 1895.

For the Applicant,

W. LLOYD WISE,

46 Lincoln's Inn Fields, London, W.C., Chartered Patent Agent.

COMPLETE SPECIFICATION.

Improvements in Apparatus for Shipping or Transferring Coal and other Materials.

I, JOHN PEARCE ROE, of 150 Leadenhall Street, in the City of London, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement :—

This invention has for object to enable coal and other material to be shipped or transferred from one place to another in a rapid and continuous manner with the minimum of labour and breakage of material as I shall now proceed to explain by the aid of the accompanying drawings wherein

Figs. 1 2 and 3 show respectively in side elevation, plan and rear elevation, one arrangement of my apparatus suitable for use with low level tracks.

Figs. 4 to 7 inclusive are detail views, to a larger scale, showing modified forms of feeding devices.

Fig. 8 is a side elevation and Fig. 9 a plan showing another arrangement of my apparatus suitable for use with high level tracks.

Fig. 10 is a diagram.

Fig. 11 shows partly in longitudinal section and partly in side elevation, a tipping cradle with movable stops for a waggon thereon, and

Figs. 12 and 13 are cross sectional views showing the stops in their operative and inoperative positions respectively.

Fig. 14 is a part side elevation showing a modified arrangement of stops, and

Figs. 15 and 16 are plans showing respectively the operative and inoperative positions of such stops.

According to my invention the coal or other material (hereinafter referred to as material) is discharged from waggons 1 or other suitable receptacles into a hopper 2 from the bottom of which it is discharged onto an endless travelling band 3, (hereinafter called the delivery band) by which the material is carried to a point whence it can be discharged into the hold of a ship 4 or other place. The capacity of the hopper may advantageously be such that the variation in the level of the material, due to the withdrawal of material from below during the short intervals between the discharge of successive waggons, will be small, so as to thereby reduce the breakage of the material to a minimum. The rate of discharge from the bottom of the hopper is regulated by suitable means which also serve to convey the material from the bottom of the hopper to the delivery band. For this purpose an endless travelling band 5, (hereinafter called for distinction the feeding band) may be used, arranged at the bottom of the hopper 2 (Figs. 1 and 4) in such a manner as to practically form an extension of the hopper bottom. When a band is thus used, it may be arranged to work beneath extensions 2^a of the hopper sides, and is preferably provided with sides flanges 5^a embracing the lower edges of the said hopper extensions so as to prevent escape of small material between such extensions and the band. Or the band 5 may be arranged to pass through an opening 2^b in the lower portion of the hopper, as shown in Fig. 5, so as to pass over the hopper bottom 2^c and between the extensions 2^a of the hopper sides. The feeding band 5 may have a non-perforated bottom, or the said band and the hopper bottom 2^c may be formed with openings to serve as screens for the escape of small material. For driving the feeding band, one of the pulleys 6 around which it passes is arranged to be driven by any suitable means such as an electric or other motor shown diagrammatically at 7. In lieu of a feeding band, an inclined shoot 8 (Figs. 6 and 7) in one or more sections may be used, arranged at the hopper

nose 2^d and having a jig motion that may be adjustable so as to regulate the discharge of material according to requirements. In Fig. 6 the shoot 8 is in one section supported by radius bars 9, 9^a, a jig motion being imparted to it by a connecting rod 10 from an adjustable pin 11 on a suitably driven crank disc 12. In Fig. 7 the shoot is composed of two sections 8, 8^a whereof 8^a is hinged to the nose of the shoot 2 at 8^b and at 8^c to the rear end of the section 8 which is supported upon radius bars 9 and has a jig motion imparted to it from a crank disc 12 as in Fig. 6. When a jig shoot is used, the sides thereof form lateral extensions of the hopper as shown. The arrangement is such that the feeding band or jig shoot, when at rest, forms a toe (indicated by the irregular line A in Fig. 4) of sufficient length to prevent flow of material from the hopper 2 and when the band or shoot is set in motion, the withdrawal of material from the hopper will be proportionate to the speed of the band or shoot and to the cross sectional area of the discharge opening in the hopper, the feeding device (band or shoot) when in motion withdrawing material of small and large size indiscriminately at a regular given rate that can be varied at will, to suit requirement, by adjusting the motion of the said feeding device.

In some cases the feeding band 5 or the jig shoot 8 may, as shown in connection with the shoots in Figs. 6 and 7, be provided with a pivoted flap 13 adapted to be turned upward from the position shown in Fig. 6 to that shown in Fig. 7 to form *inter alia* a stop when the motion of the feeding band or shoot ceases.

As the feeding band or jig shoot would have a depth of material upon it corresponding roughly to the height of the opening in the bottom of the hopper, its speed would be usually comparatively moderate, and to continue the movement of material forward, the feeding band or jig shoot is arranged to deliver onto the delivery band 3 which may advantageously run at a greater velocity and have therefore a reduced thickness of material upon it. By thus making the thickness of material upon the delivery band moderate, the structural scantlings for carrying his band, as hereinafter described, can be proportionately light, thereby enabling the band to be readily adjusted or moved to adapt it to various applications where this power of adjustment would be advantageous, as for example in shipping coal, where it is of importance to be able to move the outer end of the delivery band to various positions over a vessel's hatchways and to provide for differences in level.

The angular or radial adjustment of the delivery band can be effected in various ways.

In the arrangement shown in Fig. 1 the delivery band 3 is mounted to run over pulleys 14, 14^a journalled in girders 15 over which the band travels and which are pivoted at their inner ends at 15^b to admit of vertical turning movement of the band. To permit of horizontal movement, the hopper may be mounted to turn bodily, or it may, as shown in Figs. 1, 3 5 and 8, be made in two parts 2, 2^a that are circular in plan at the line of junction and the lower of which (2^a) together with the feeding and delivery bands 5 and 3 respectively, is made to turn horizontally upon and about a centre 16 the centre of motion in each case corresponding to the centre of the circular portion of the hopper. This arrangement admits of a large radius for horizontal swing, and of a simple construction of driving mechanism, shown diagrammatically at 17, for the delivery band 3, besides keeping the feeding and delivery bands always in line.

The inner end of the delivery band 3 may be so mounted, or supported, as for example on a carriage or slide 18, (Fig. 1) as to enable the band to be run in and out so as to serve for example a wide hatch, and also to permit of its being housed as shown in dotted lines in Fig. 1. The girders 15 carrying the outer portion of the band are jointed at 15^a to the carriage or slide 18 so as to allow for the vertical radial movement of the said outer portion of the band.

In the construction shown in Figs. 1, 2 and 3, the hopper 2, 2^a, feeding band 5 and delivery band 3 are mounted in a frame 19 arranged to travel on ways parallel to a quay wall 20, the lower portion 2^a of the hopper with feeding band 5 and motor 7, carriage or slide 18 with the inner end of the delivery band 3 and the

motor 17 for driving the latter being mounted upon a separate frame 21 pivoted to the frame 19 at 16 so that it can turn horizontally.

In the arrangement shown in Fig. 8, the upper portion of the hopper 2 is carried by a stationary frame 19 and the inner end of the delivery band and adjacent parts are mounted on a frame 21 pivoted at 16 so as to permit of a radial or turning movement over the quay wall 20. The forward end of the frame 21 may as shown in Fig. 5, be supported upon a circular way 22.

The outer ends of the girders 15 supporting the delivery band 3 are or may be supported from a structure by suitable connections operated by hydraulic or other mechanism for effecting and permitting the horizontal and vertical adjustments of the band. In Figs. 1 and 3 the outer end of the delivery band is suspended by ropes or chains 22 23 that are connected to a shoot 24, pivoted to the outer end of the girders 15 and are adapted to be respectively operated by hydraulic motors 22^a 23^a for effecting vertical adjustment of the delivery band and shoot 24. The motors 22^a, 23^a are fixed upon an auxiliary frame 25 pivoted at 25^a to the main frame 19 which is provided with a circular way 19^a on which the auxiliary frame can be moved for the purpose of effecting the horizontal radial movements of the delivery band and shoot 24.

To admit of a number of waggons being quickly discharged one after another into the main hopper, and thereby to avoid the loss of time involved when each empty waggon has to be moved back to a crossing at the rear of the tip, the entering and leaving tracks may be so arranged in relation to the tipping apparatus that each waggon can be moved from the one track to the other by means of a crossing, turntable or traverser located in front of the tip, the arrangement in each case being such as to admit of a waggon after being dumped passing on in the same direction so as to admit of the next waggon to be dumped following immediately in the rear of the first one.

In the arrangement shown in Figs. 8 and 9, suitable for use where the waggons are to be tipped, there is an oscillating cradle 26 to receive and tip each waggon in succession. The cradle may be operated in the usual way either by mechanical power, or by gravity. In the example shown it is pivoted at 26^a and is raised into the dotted position for dumping by the ram of a hydraulic motor 27. For holding the waggon in position for dumping, the cradle is provided according to this invention, with moveable stops 28 against which each waggon takes when in position for tipping, the said stops being so constructed and arranged that they can be caused to swing or otherwise move clear of the waggon to permit of its being passed forward when emptied. In the example shown in Figs. 11 to 13 inclusive, there are two stops 28 each carried by a lever 28^a in the form of a plate mounted to turn about a horizontal axis at 28^b, the lower arms of the two levers being connected by rods to the two arms of a lever 28^c that is fixed upon a shaft 28^d provided with a second lever 28^e by which it can be operated by a hydraulic motor 28^f, or be otherwise operated for the purpose of simultaneously moving the pair of stops 28 into either the operative position (Fig. 12) or the inoperative position (Fig. 13), as may be desired. In the modified arrangement shown in Figs. 14, 15 and 16, the levers 28^a carrying the stops 28 are mounted to turn about vertical axes. After being tipped each waggon may move onward to reverse points and crossing 29 (Fig. 10); or to a turntable 29^a (Fig. 10); or to a traverser 29^b (Figs. 8 & 9) arranged, in either case, in front of the cradle 26 and hopper 2 so that the waggon can be transferred from the track 30 to the track 30^a.

For low level tracks an elevator and drop may be provided whereby the waggons can be lifted at one end of the tip and lowered at the other end thereof after being dumped. The tracks may be arranged either parallel with, or at an angle to the quay wall, and the elevator and drop may be arranged to turn through any desired number of degrees during ascent and descent when the lower tracks do not run in line with those at the high level.

In Figs. 1 to 3 inclusive, 31 and 32 are respectively an elevator and drop each

in the form of a cage adapted to work vertically in guides 33 the raising in each case being effected by a hydraulic motor 34 through a chain 35, and the lowering being effected by gravity. In the arrangement shown, the tracks 30, 30ª are arranged at right angles to the quay wall, and the elevator and drop are each turned through a right angle during ascent and descent by fixed spiral guide-ways 36 in which extensions 37 on the elevator and drop work for the purpose of bringing the waggon in the one case into position to run upon the upper track 30ᵇ, which extends across the top of the hopper 2, and in the other case to again bring the waggon into position to be run onto the return track 30ª.

When hopper bottom or other type of self-dumping waggons are used, as shown in Figs. 1, 2 and 3, the tip cradle is dispensed with.

Where a hopper 2 and the other devices hereinbefore described, are carried by a movable frame 19, the tipping or dumping apparatus with traverser, or crossing and points, or turntable, or the elevator and drop, as the case may be, can, as shown in connection with the elevator and drop in Figs. 1, 2 and 3, be mounted on the said frame so that the whole can be moved together.

Various means may be provided for conducting or distributing the stream of material in any desired direction and to any desired place after it leaves the end of the delivery band. For this purpose a curved or other shaped shoot or guide (hereinafter called a delivery shoot) may be used, jointed in such a manner as to admit of vertical adjustment by any suitable means. This delivery shoot may be of various shapes.

In Fig. 17, there is shown a straight delivery shoot 24 adapted to discharge over its lower end. In Fig. 1, the shoot 24 has a discharge opening in the bottom.

Fig. 18 shows a delivery shoot of the kind represented in Fig. 1, but having mounted thereon a rotary distributing sheet 38ª in a manner hereinafter described.

For distributing or trimming coal or other material, as for example in the hold of a ship, I provide in connection with apparatus, such for example, as that hereinbefore described, adapted to supply material, mechanical trimming devices that can be suspended from a point or points outside a ship's hold, so as to be capable of being readily inserted into, manœuvred within and withdrawn from the ship's hold, and are so constructed and arranged that the material can be delivered fore and aft and athwart ship in such a manner as to avoid impact and breakage as far as possible.

Where the place to which the material is to be delivered is such that the force of gravity will be sufficient to cause the delivery of the material to the required place, the trimming device may be in the form of a curved shoot the entry end of which may be approximately vertical whilst the lower portion is curved in a lateral direction, and may be of such a shape as to considerably reduce the velocity of the material before it finally leaves the shoot. The said shoot may be made in two or more sections capable of moving one over or within the other.

Figs. 19 and 20 are elevations showing two forms of such shoot 44 each provided with suitably arranged eyes 44^a 44^b by which it can be suspended by ropes 44^c, 44^d (Figs 1 1^a) from a jib 42 mounted to turn about a horizontal axis on a pillar 43 (Fig. 1) which is mounted to turn about a vertical axis, the arrangement being such that the trimming device can be suspended from a point outside the ship's hold. By the means described velocity due to gravity is utilized, in conjunction with guiding surfaces, to gradually change the direction of flow of material from the vertical to the desired direction, at the same time reducing impact.

Fig. 21 shows another arrangement of trimming device comprising an endless conveying band 45 driven where necessary by a self contained motor, and arranged to pass over drums 46 carried by light girders 47 which are telescopically mounted in relation to other girders 47^a, the device being suspended by the ropes 44^c 44^d so that it can be conveniently adjusted to suitable heights and positions, and the arrangement being such that material delivered upon the receiving end of the

band 45 will be carried forward and delivered where required. The girders 47 may be moved relatively to the girders 47^a by means of a chain 49 connected to the girders 47 and passing over chain wheels 48 which are mounted on the girders 47^a and one of which is arranged to be driven by suitable mechanism 48^a.

Fig. 22 is a side elevation showing another arrangement of trimming device. It comprises a shoot 44 and band 45, the first being arranged to deliver by gravity onto the second which carries the material forward and delivers it at the required place, the whole being suitably suspended as before and the band being driven, where necessary, by a self-contained motor indicated diagrammatically at 50 and being capable (when desirable) of movement relatively to the shoot by means such as that hereinbefore described with reference to Fig. 21 so that the length of the said device can be varied to suit different requirements. Fig. 23 shows an arrangement somewhat similar to Fig. 21 but in which the band 45 has a mean inclination such that it will be automatically moved under the action of the load carried thereby. In this case a suitable brake or regulator may be provided to control the velocity. The girders carrying the band may be provided at the receiving end with a shoot or guide 44 as shown in Fig. 23, or the said band may receive material direct from the delivery apparatus without a shoot or guide being combined with the trimming device, as shown in Fig. 23^A.

The shoot 44 and band 45 may in some cases be constructed and arranged as shown in Fig. 24 so that the material would be allowed to accumulate in the shoot from the lower end of which it would be withdrawn in a regular manner by the band.

The shoot 44 when used alone or in conjunction with a band may be made of a sinuous, zig-zag or other form in side view so as to occupy a comparatively short space horizontally as shown in Fig. 25 and exert a retarding action on material passing through it.

Where the velocity of the material would be high in trimming apparatus of the kind hereinbefore mentioned, the discharging end of the apparatus may be so formed as to retard the velocity of the material. To permit of this being done without choking, the material is allowed to spread and deliver itself over an increased area.

For this purpose there may be provided at the delivery end of the shoot 44 (Figs. 19 and 20) or band 45 (Fig. 26) a retarding and distributing device consisting of a plate 51 constituting in effect a prolongation of the shoot or band and the upper surface of which is so shaped as to spread the material delivered upon it and cause it, or some of it, to escape laterally.

Fig. 27 is a plan of the shoot 44 shown in Fig. 20 provided with one form of such a retarding and distributing device, and Figs. 28 and 29 are cross sections on the lines A A and B B respectively of Fig. 27. In this case the plate 51 is made of enlarged or flaring form, with the lateral portions 51^a inclined downward for the purpose mentioned. The central portion of such a plate may be of concave form in cross section instead of being flat as shown, or it may be of convex form as in Fig. 1.

In some cases the plate 51 may be made capable of adjustment relatively to the shoot or band so as to enable the extent of retarding action, or direction of distribution, or both, to be varied. For this purpose the retarder and distributor 51 may be pivoted at the end of the shoot or band as shown in Figs. 19 and 26 and be arranged to be turned by gearing 52.

The trimming devices shown in Figs. 19 to 29 inclusive may be suspended in a ship's hold by ropes or chains 44^c 44^d, as described with reference to Figs. 1^a 19 and 20 & so as to be independent of the delivery shoot 24. Or such devices may be connected to the shoot 24 as well as to the ropes or chains 44^c 44^d. In this case the upper end of the shoot may be detachably connected by a pin 53 to a ring 54 capable of rotary movement on a ring 55 on the shoot 24, antifriction balls 56 being preferably placed between the two rings as shown in side elevation and cross section respectively in Figs. 30 and 31.

The endless bands used in apparatus of the kind hereinbefore described may be supported between the end guide rollers and have a suitable tension imparted to them, in any known or suitable way.

The apparatus hereinbefore described is especially applicable to loading ships for converting the intermittent supply of material produced by tipping or dumping into a continuous flow or stream of material of moderate dimensions, which can be conveniently conducted to and trimmed or stowed for example in a ship's hold with a rapidity and saving of labour that is not possible where large bulks are discharged at intervals direct into the ship.

The apparatus can be adapted in the main or in part to be worked in conjunction with a pontoon or float for the purpose of conveying material from one vessel or lighter to another, or to the shore; also for conveying or transporting material in mining or other works as shown for example in Fig. 32 when the delivery band 3 is represented as working down a hill slope for delivery into waggons or other receptacles. In the example shown, the delivery band will be driven by the load and in turn drive the feeding band 5; a brake may be provided for controlling the rate of delivery.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed I declare that what I claim is:—

1. Apparatus for shipping or transferring coal and other materials comprising a hopper, a delivery band, and a feeding device such as an endless band or jig shoot, located between the hopper and delivery band, the arrangement being such that material fed into the hopper can be withdrawn from the bottom of the latter and discharged upon the delivery band by which it can be delivered into the hold of a ship or other place substantially as described.

2. Apparatus of the kind referred to in the preceding claim wherein the girders or supports carrying the delivery band are pivoted at their inner ends to turn about a horizontal axis, and the hopper, or the lower portion thereof, together with the feeding device and delivery band, is mounted to turn about a vertical axis, the arrangement being such as to admit of the discharging end of the delivery band being adjusted both vertically and horizontally, substantially as herein described.

3. Mounting apparatus of the kind referred to in the preceding claims in a main frame or structure and supporting the discharging end of the delivery band by an auxiliary frame capable of radial movement and provided with means whereby the position of the said end of the delivery band can be varied to suit requirement, substantially as described.

4. In apparatus of the kind referred to in the preceding claims, mounting the inner end of the delivery band upon a movable support below the feeding device so that the delivery band can be run in and out substantially as hereinbefore described for the purposes specified.

5. In apparatus of the kind referred to in the preceding claims, feeding devices constructed and operating substantially as hereinbefore described with reference respectively to and shown in Fig. 4; in Fig. 5; in Fig. 6; and in Fig. 7 of the accompanying drawings.

6. In apparatus for shipping or transferring coal and other materials, the arrangement in connection with an entering track provided with a tip, and a leaving track, of means such as a crossing and points, or a turntable, or a traverser, arranged in front of the tip whereby a waggon after being dumped can pass on in the forward direction on the entering line and be then transferred to the leaving line so as to admit of the next waggon to be dumped following immediately in the rear of the first one, substantially as described.

7. In an arrangement of the kind referred to in the preceding claim, providing in connection with an oscillating cradle adapted to tip a waggon endway movable stops adapted to be moved into position to hold a waggon on the cradle during end tipping and to be afterwards moved clear of the waggon to permit the same to

move forward, substantially as hereinbefore described with reference to Figs. 11 to 16 inclusive of the drawings annexed.

8. In apparatus for shipping or transferring coal and other materials, the combination with low level tracks and a raised tip and hopper, of an elevator and drop whereby waggons can be raised at one end of the tip and after being dumped can be moved forward and lowered at the other end of the tip, means being provided for automatically turning the elevator and drop during ascent and descent when the lower tracks do not run in line with that at the higher level, substantially as described.

9. The combination with apparatus of the kind referred to in Claims 1 to 4 inclusive for shipping coal and other material, of a trimming device suspended below the delivery end of the apparatus from points outside the ship's hold so as to be capable of being readily inserted into, manœuvred within and withdrawn from a ship's hold and whereby coal or other material supplied by the said apparatus can be delivered fore and aft and athwart ship, substantially as described for the purpose specified.

10. In apparatus for shipping coal or other material a mechanical trimming device comprising an endless band passing over rollers carried by girders adapted to be suspended in a ship's hold from a point outside the same, whether or not the said girders be carried by other girders in relation to which the first mentioned girders can be moved telescopically, the arrangement being such that material fed upon the band will be carried forward thereby and delivered where required, substantially as described.

11. In apparatus for shipping coal and other material, a mechanical trimming device adapted to be suspended in a ship's hold as referred to in Claim 9 and comprising a combined shoot and endless band the one being arranged to deliver material by gravity onto the other which carries the material forward and delivers it at the required place, substantially as herein described, whether or not a motor be provided for driving the band, and whether or not the shoot and band be relatively movable for varying the length of the said device.

12. The combination with a mechanical trimming device of the kind herein referred to, of a retarding and distributing device consisting of a plate the upper surface of which is so shaped as to retard and spread material passing over it substantially as herein described for the purpose specified.

13. In apparatus of the kind referred to, the combination with a delivery band and a shoot or guide jointed to the delivery end of the girders carrying the said band, of a mechanical trimming device mounted upon the discharging end of the said shoot or guide so that it can be turned around the same, substantially as hereinbefore described with reference to Figs. 30 and 31 of the accompanying drawings, for the purpose specified.

14. My improved apparatus for shipping or transferring coal and other material, constructed arranged and operating substantially as hereinbefore described with reference to and shown in Figs. 1, 2 and 3; in Figs. 8, 9 and 10; and in Fig. 32 of the accompanying drawings.

15. My improved mechanical trimming devices constructed, arranged and operating substantially as hereinbefore described with reference to and shown in Fig. 19 in Figs. 20, 27, 28 and 29; in Figs. 21, 22, 23 and 23A whether modified according to Fig. 26 or not; in Fig. 24; and in Fig. 25 of the accompanying drawings.

Dated this 3rd day of June 1896.

For the Applicant,

W. LLOYD WISE,

46 Lincoln's Inn Fields, London, W.C., Chartered Patent Agent.

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[G. 7984—50—6/1904.]

Fig. 1.

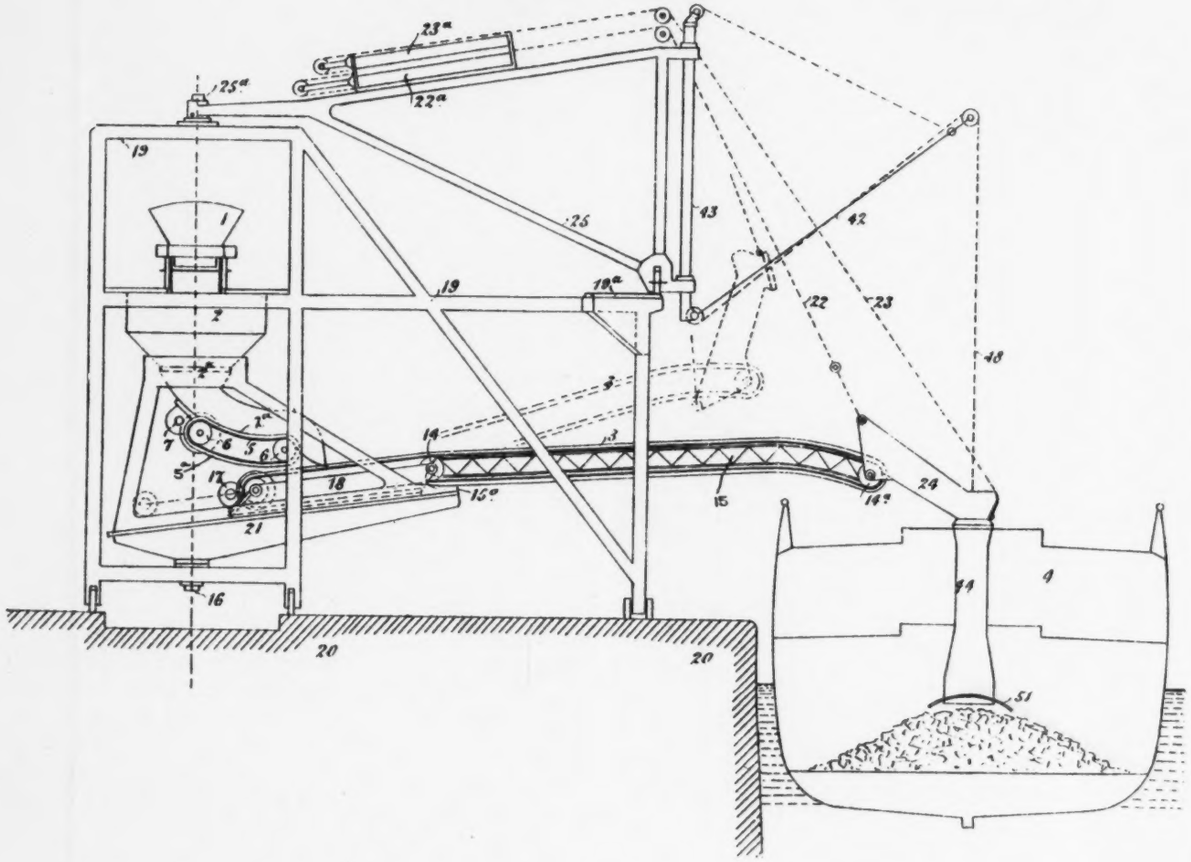
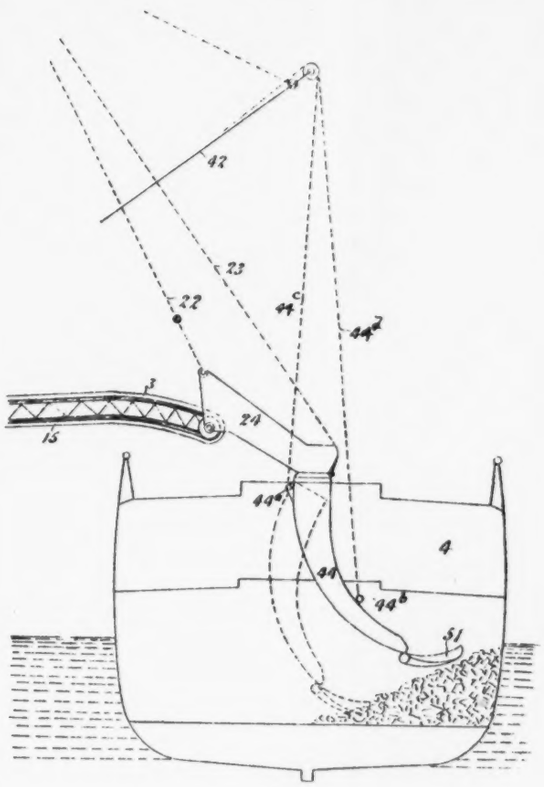


Fig. 1a.



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A.D. 1895. Sep. 3. Nº 16,525.
ROE'S COMPLETE SPECIFICATION.

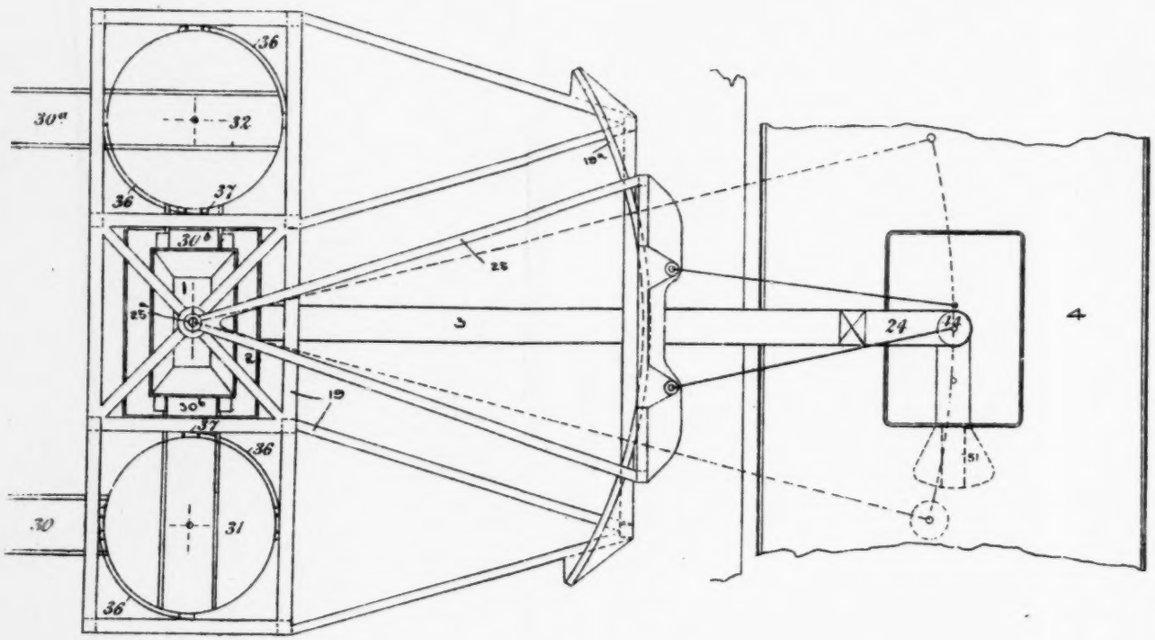
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SHEET 3.

Fig 2



SHEET 4.

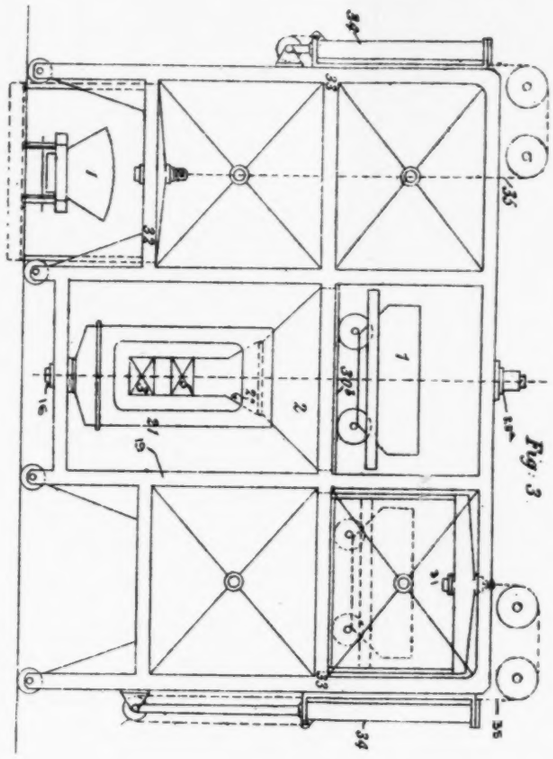


Fig 3

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Fig: 4

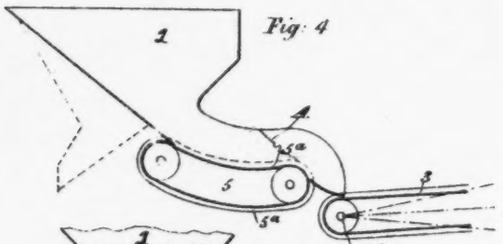


Fig: 5

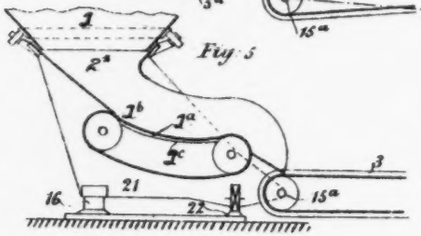


Fig: 6

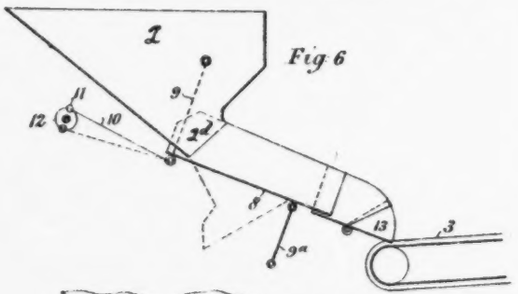


Fig: 7

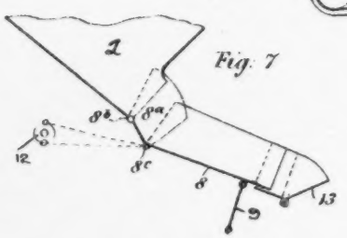


Fig: 10.

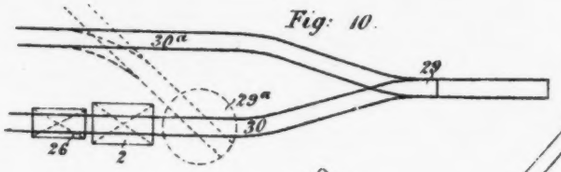
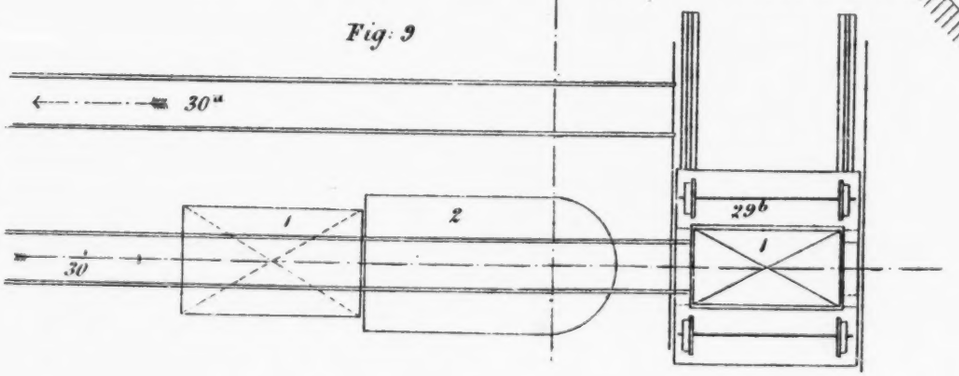


Fig: 8.

Fig: 9



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Fig. 17.

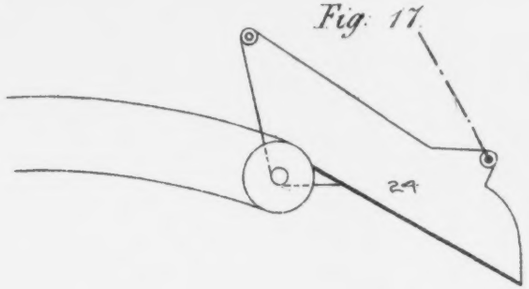


Fig. 18.

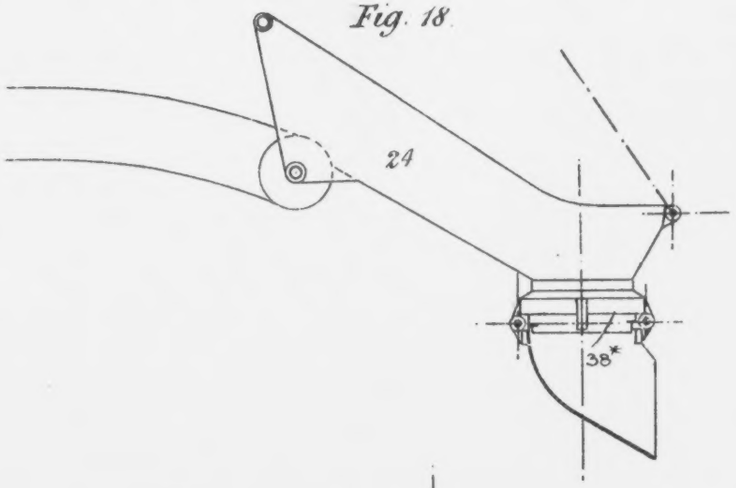


Fig. 30.

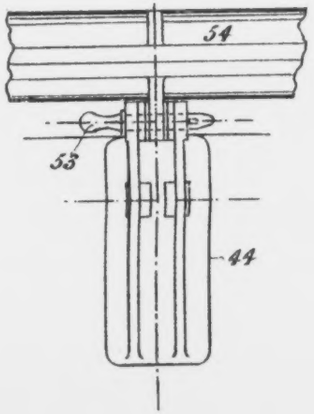


Fig. 31.

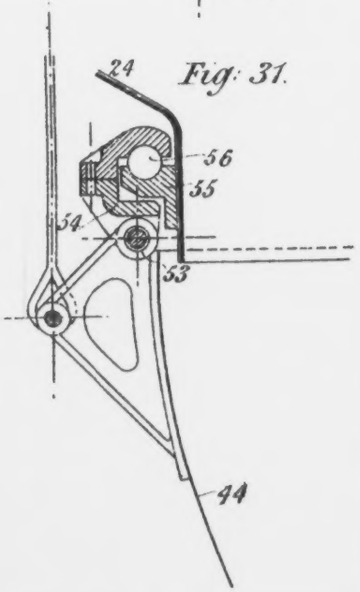


Fig. 11.

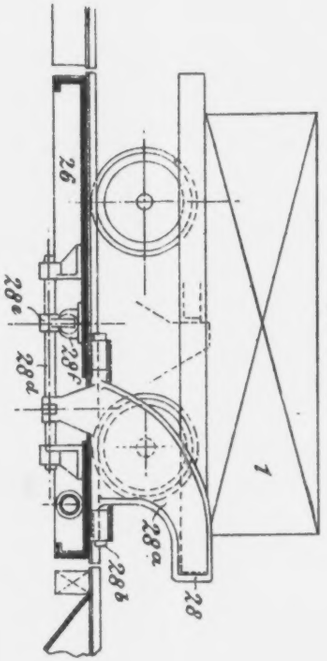


Fig. 14.

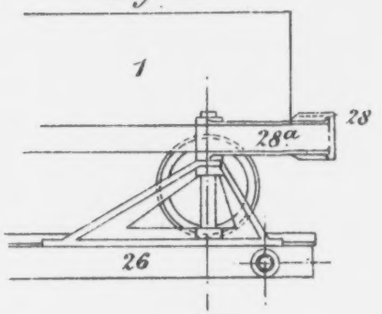


Fig. 15.

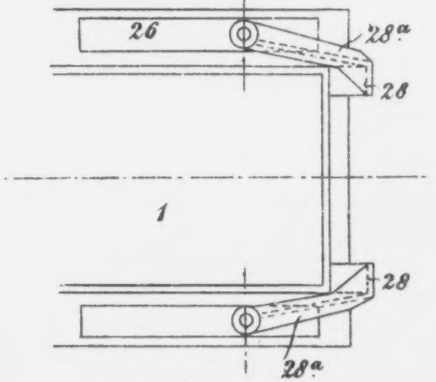


Fig. 12.

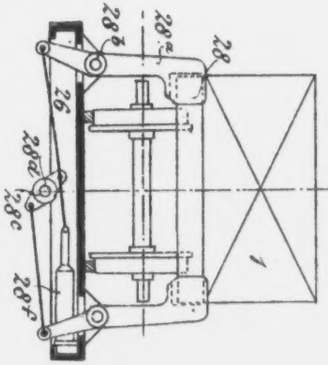


Fig. 16.

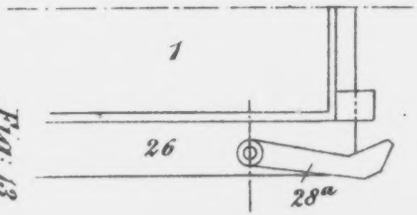
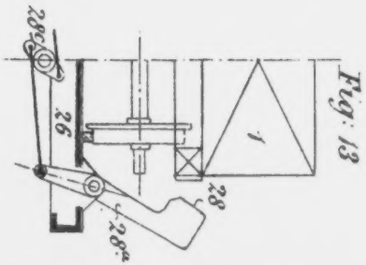


Fig. 13.



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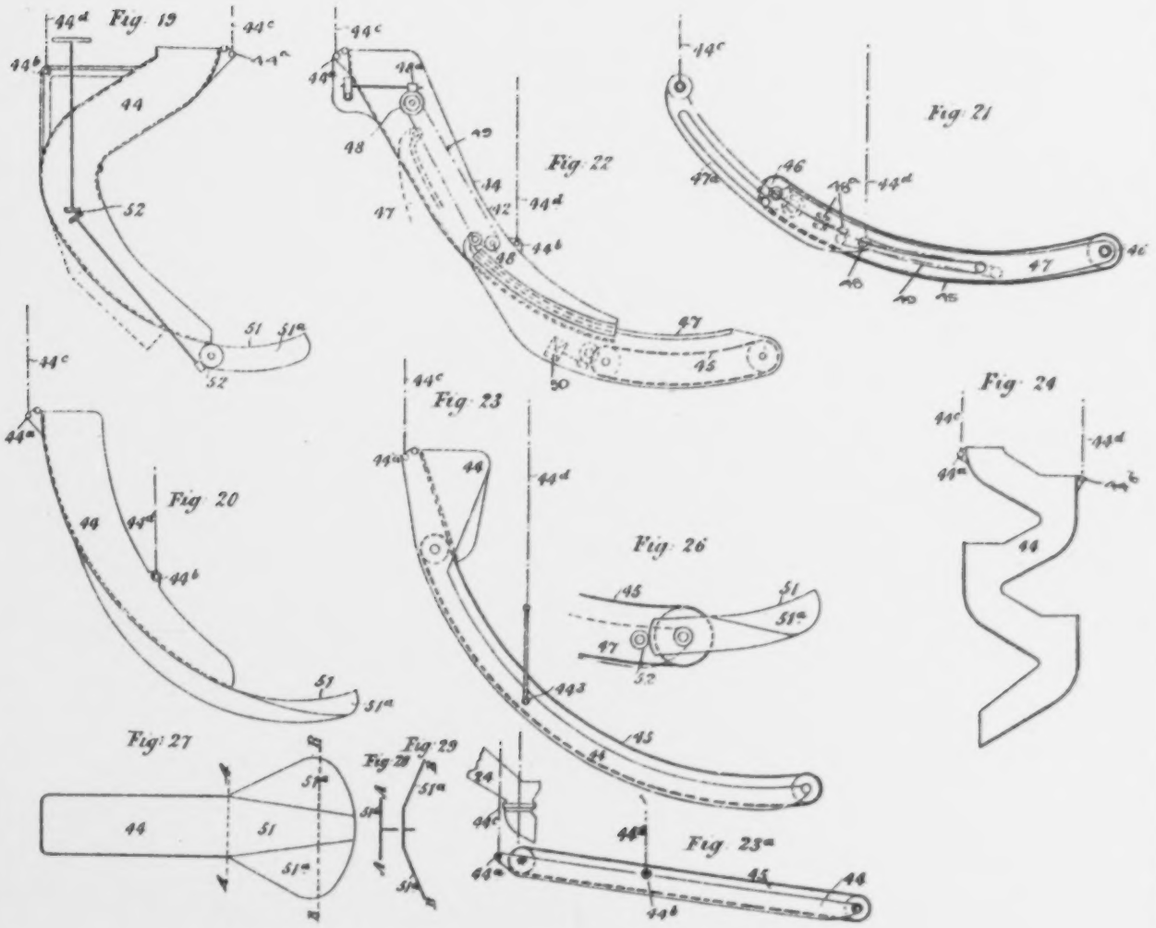
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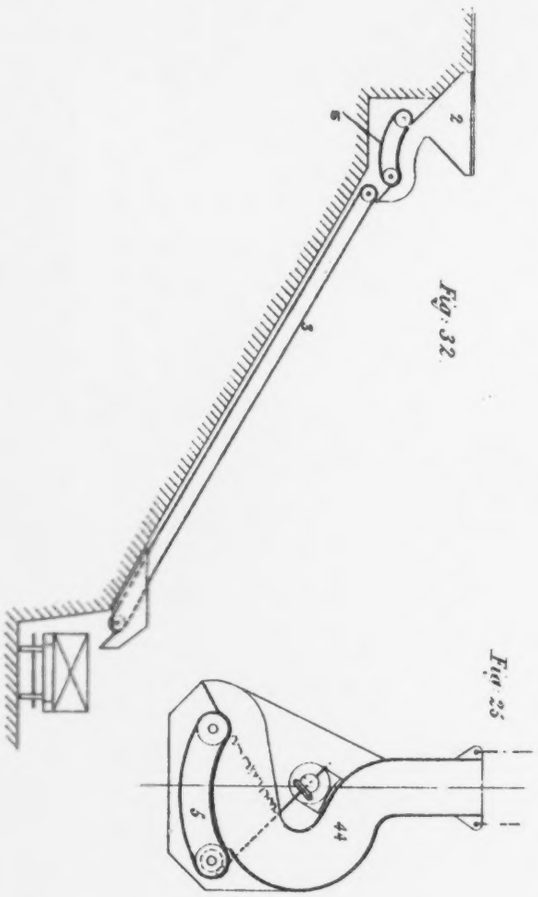
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SHEET 9.



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[Second Edition.]

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605–606

N° 19,554 A.D. 1903

Date of Application, 10th Sept., 1903—Accepted, 15th Oct., 1903

COMPLETE SPECIFICATION.

An Apparatus for Distributing Cargoes in a Vessel's Hold or other Places."

We, GERALD EDWARD HOLLAND, C.I.E, D.S.O. Commander, Royal Indian Marine, Principal Port Officer, Burma, and HENRY JOHNSTON, Chief Engineer, Royal Indian Marine, Government Superintending Engineer, and Shipwright Surveyor to the Port of Rangoon, Burma, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement :—

This invention relates to a labour saving apparatus for use in conjunction with coal and bag heavers for mechanically distributing in a vessel's hold the cargoes loaded by them.

In the accompanying drawings, Fig. 1 is a cross section of a vessel fitted with our cargo distributor. Fig. 2 shews the distributor when not in use, and Fig. 3 is a plan of the distributor.

A receptacle A built of light steel plating or other suitable material is fitted with a revolving tube B in the bottom, attached to which is a telescopic shoot C as shewn in Fig. 1, the length of which can be regulated as required.

The revolving tube allows the shoot to be pointed in any direction, and the telescopic arrangement of the latter enables the cargo to be delivered into any part of the ship's hold.

A shoot D serves to convey the coal or other material from the delivery end F of the heaver to the receptacle A of the distributor.

In cases where the top deck is planked over, a small hatch E is fitted as shewn in Fig. 1, when the distributor is at work.

By this apparatus a cheap, rapid and labour saving method of loading or placing cargoes in a vessel's hold is obtained.

The method of working the apparatus is very simple and easily understood. The cargo first passes through the shoot D, which is so inclined that the cargo by its own weight falls into the receptacle A and thence into the revolving tube B, from which it passes into the telescopic shoot C, and so into the ship's hold into its required place.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is :—

A cargo distributor, consisting of a receptacle, a revolving tube and a telescopic shoot constructed and operating substantially as described.

Dated this 10th day of September 1903.

ABEL & IMRAY,
Agents for the Applicants.

Hereford : Printed for His Majesty's Stationery Office, by The Hereford Times Ltd.
[Wt. 55—25/11/1920.]

[*Price* 1*s.*]

A.D. 1903. Sept. 10, No. 19,554.
HOLLAND & another's Complete Specification.

607–608
(1 SHEET)

(2nd Edition)

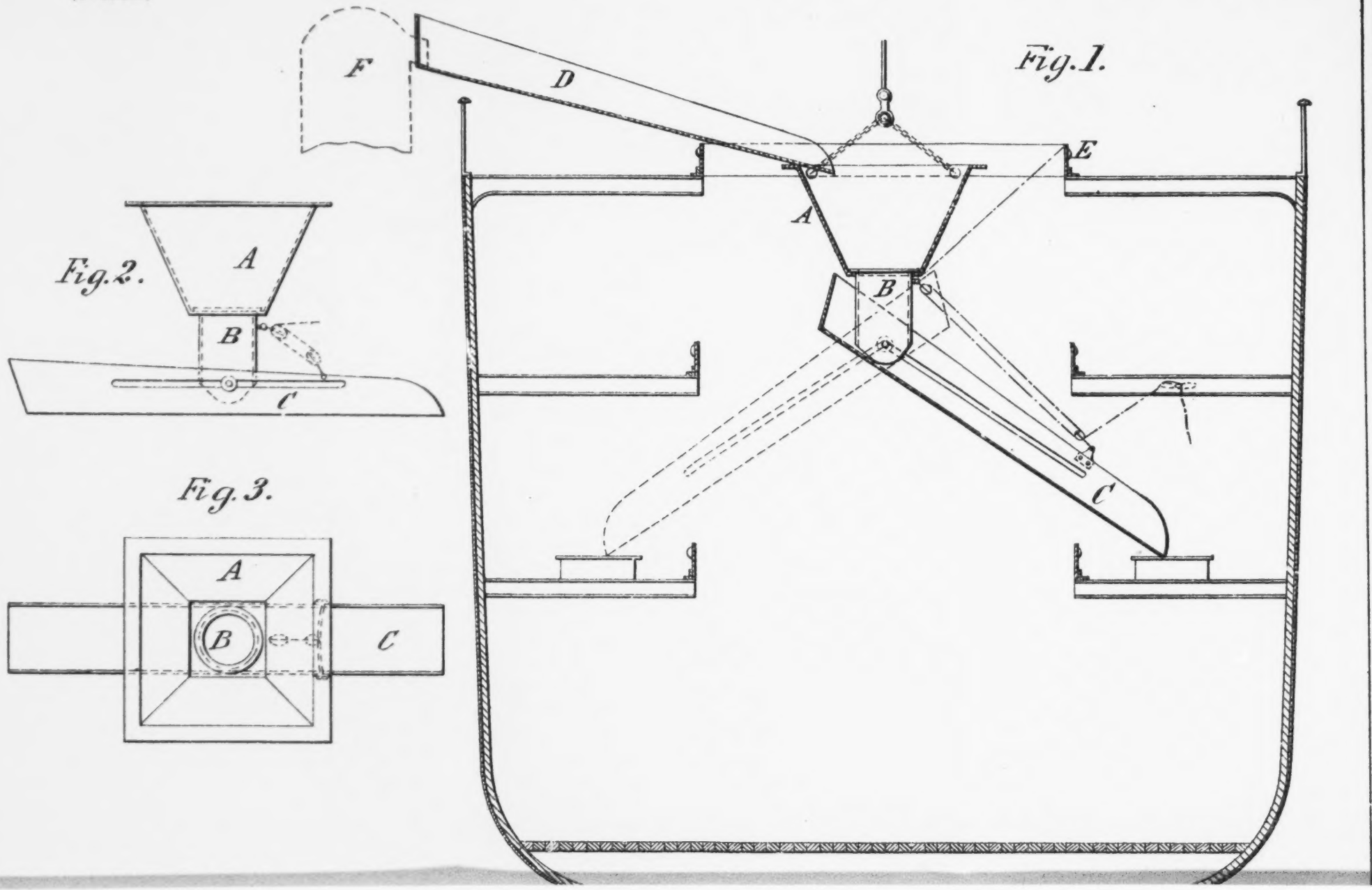


Fig. 1.

Fig. 2.

Fig. 3.

[This Drawing is a reproduction of the Original on a reduced scale]

925
609

N° 7307 A.D. 1908

Date of Application, 2nd Apr., 1908
Complete Specification Left, 7th Aug., 1908—Accepted, 1st Apr., 1909

PROVISIONAL SPECIFICATION.

"Improvements in Apparatus for Laying Concrete"

We, ALEXANDER GIBB, of Goytrey House, Pontypool, Monmouthshire, Civil Engineer, and THOMAS GRAHAM MENZIES, of 130 Wellesley Road, Chiswick, London, Civil Engineer, do hereby declare the nature of this invention to be as follows:—

The present invention has reference to apparatus for the use of contractors and others employed in work where a large amount of concreting is to be done, as for instance, in making dock walls and the like and the object of the invention is to provide means whereby the work can be carried out more expeditiously than heretofore.

In work of this description it is usual to employ appliances for the excavation and removal of the soil and for the delivery of concrete to the trench.

To save time the concreting appliances are made to follow up the excavators as closely as possible but there is much delay owing to stoppages in one department to make way for the other to proceed. For instance, in certain cases the mixer of the concreting appliance cannot be continuously fed when the supply wagons have to stand aside while wagons of excavated earth are being removed.

According to this invention the excavating and concreting appliances are so arranged that the work of each can proceed continuously without clashing with the operation of the other.

In carrying our invention into effect we lay alongside the place to be concreted a line of rail upon which moves the excavators or the cranes for raising the soil dug out of the trench. Straddling this second line of rail is a track for the concreting machine which is supported on a carriage designed to pass over loaded trucks without touching them. At the back of the track of the concreting machine is a track for the trucks which bring supplies for the same and between this track last named and the concreting machine track is a small parallel track for the specially designed feeding appliance of the concreting machine which appliance moves to and fro with the latter as it works up and down the track during the progress of the work. It may here be convenient to note that the cranes being on one track, the trucks on another, the concreting machine on a third, straddling the trucks, and the second set of trucks for bringing supplies to the concreting machine on a fourth track, all these can pass to and fro without coming into conflict and delaying each other. The concreting machine which we employ is in some respects similar to such machines already in use in that it comprises a mixer of any suitable construction and a telescopic shoot for discharging the mixed concrete into the place required. This telescopic shoot we propose to mount in such a way that it can be adjusted to any required elevation within limits and we also propose to provide an elevating bucket by means of which the concrete may be lifted from the level of the mixer and delivered to the said shoot when the latter is working in its higher positions. The mixer is fed by a system of buckets working vertically and these buckets are kept supplied by the feeding appliance located on the track above referred to. This feeding appliance consists of a wheeled carriage attached to and moving with the concreting machine. Upon the carriage are a number of measuring hoppers

[illegible]

PRICE 1/-

which can be filled with the ingredients of the concrete from the supply trucks alongside. Beneath the measuring hoppers are travelling belts working towards a central point where the vertical system of buckets above mentioned is situated. Men are continuously employed filling the measuring hoppers which are discharged onto the travelling belts so that the feed of the mixer is kept constantly supplied. By avoiding the necessity of stopping the work in one department for the convenience of another and by keeping the concrete mixer constantly fed a great improvement in the speed of carrying out the work can be effected.

Dated this 2nd day of April, 1908.

NEWTON & SON,
6, Bream's Buildings, Chancery Lane, London, E.C.
Agents for the Applicants.

COMPLETE SPECIFICATION.

"Improvements in Apparatus for Laying Concrete."

We, ALEXANDER GIBB, of Goytrey House, Pontypool, Monmouthshire, Civil Engineer, and THOMAS GRAHAM MENZIES, of 130 Wellesley Road, Chiswick, London, Civil Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention has reference to apparatus for the use of contractors and others employed in work where a large amount of concreting is to be done, as for instance, in making dock walls and the like and the object of the invention is to provide means whereby the work can be carried out more expeditiously than heretofore.

In work of this description it is usual to employ appliances for the excavation and removal of the soil for the supply of building material, brick, stone, and the like, and for the delivery of concrete to the trench.

To save time the concreting appliances are made to follow up the excavators and building appliances as closely as possible but there is much delay owing to stoppages in one department to make way for the other to proceed. For instance in certain cases the mixer of the concreting appliance cannot be continuously fed when the supply wagons have to stand aside while wagons for the excavators and builders are being served.

According to this invention the excavating, concreting, and building appliances are so arranged that the work of each can proceed continuously without clashing with the operations of the other.

In carrying our invention into effect we lay alongside the place to be concreted a line of rail upon which move the excavators or the cranes for handling the soil or building materials, parallel with this line and behind the same is another for the trucks which are to receive the soil dug out of the trench or to feed building materials. Straddling this second line of rail is a track for the concreting machine which is supported on a carriage designed to pass over loaded trucks and locomotives without touching them. At the back of the track of the concreting machine is a track for the trucks which bring supplies for the same and between this track last named and the concreting machine

track is a parallel track for the specially designed feeding appliance of the concreting machine which appliance moves to and fro with the latter as it works up and down the track during the progress of the work. Instead of arranging the track for the feeding appliance or conveyor between the concreting machine track and the track of the supply trucks, the former may be arranged if preferred between the lines of the supply truck track, and contents of the trucks may be discharged on to the feeding appliance through trap doors or their equivalent in the said trucks. It may here be convenient to note that the cranes being on one track, the trucks on another, the concreting machine on a third, straddling the trucks, and the second set of trucks for bringing supplies to the concreting machine on a fourth track, all these can pass to and fro without coming into conflict and delaying each other. The concreting machine which we employ is in some respects similar to such machines already in use in that it comprises a mixer of any suitable construction and a telescopic shoot for discharging the mixed concrete into the place required. This telescopic shoot we propose to mount in such a way that it can be adjusted to any required elevation within limits and we also propose to provide an elevating bucket by means of which the concrete may be lifted from the level of the mixer and delivered to the said shoot when the latter is working in its higher positions. The mixer is fed by a system of buckets working vertically and these buckets are kept supplied by the feeding appliance located on the track above referred to and arranged so as to be accessible to a number of men shovelling material on to it simultaneously at a number of different points. This feeding appliance consists of a wheeled carriage attached to the to and moving with the concreting machine. Upon the carriage are a number of measuring hoppers which can be filled with the ingredients of the concrete from the supply trucks alongside. Beneath the measuring hoppers are travelling belts working towards a central point where the vertical system of buckets above mentioned is situated. Men are continuously employed filling the measuring hoppers which are discharged onto the travelling belts so that the feed of the mixer is kept constantly supplied. By avoiding the necessity of stopping the work in one department for the convenience of another and by keeping the concrete mixer constantly fed a great improvement in the speed of carrying out the work can be effected.

In the accompanying drawings a form of the machine is illustrated in which:—

Fig. 1 shews diagramatically in end elevation an apparatus suitable for building a dock wall of concrete according to the system of the present invention.

Fig. 2 is a side view, and

Fig. 3 is a plan,

Fig. 4 is an end view of the apparatus drawn on a larger scale and in greater detail.

Fig. 5 is a back view of the concreting machine and feeding appliances and supply conveyor,

Fig. 6 shews still more enlarged, and in greater detail, the means for feeding and manipulating the discharge shoot when in the higher positions,

Fig. 7 is a detached view of the bucket which feeds the shoot in the higher positions taken at right angles to the view of Fig. 6,

Fig. 8 is a cross section on the line A A of Fig. 5 enlarged, of the conveyor,

Figs. 9 & 10 are front and side views in detail of the mixer feeding bucket guides.

Fig. 11 is an enlarged front view of the discharge shoot shewing the tackle for moving it up and down.

a is the trench alongside which runs the track *b* for the excavating appliances which may comprise cranes *c*. Next the track *b* is a wide track *d* on which runs the carriage of the concreting machine, which will be described hereafter in greater detail. Between the rails of the track *d* is a track *f* of normal gauge,

which takes the trucks brought up to receive the earth excavated from the trench. *g* is a track for the conveyor *h* which is attached to the concreting machine, and *i* is a track for the trucks which bring supplies alongside the conveyor *h*. If desired, and circumstances permit, one or more tracks may be arranged on the opposite side of the trench.

The concreting machine *e* comprises a carriage of any suitable construction supporting an engine and boiler *j*, and a concrete mixer *k* which may be of any approved type. Driving gear is provided for propelling the carriage along its track *d*, and for working the mixer *k*. The engine also supplies the power for driving the belts *l l* of the conveyor *h* by means of chains or their equivalent indicated by dotted lines at *m m*, power for elevating the mixer feeding buckets *n n*, the shoot feeding bucket *o*, and the shoot *p* itself.

To feed the mixer *k* two buckets *n n* are employed which descend alternately into the space between the ends of the divided portions of the conveyor *h* (see Fig. 5). These buckets are manipulated by cords passing over pulleys to winches *q q*. *r r* are guides for the buckets, and *s* is a switch with a forked end (see Figs. 9 & 10) hinged centrally and arranged to engage with each bucket and guide it when filled into its proper channel. Ordinary tipping mechanism for the buckets is provided by which the contents are automatically discharged into the hoppers of the mixer *k*.

The buckets *n n* are kept regularly at work under the control of an attendant who operates clutches wherewith the lifting gear is supplied, and the mixer is kept in constant rotation so as to mix up well the ingredients for concrete supplied to it with water which is supplied to the mixer through a flexible hose from a tank preferably carried on the machine. At intervals the mixer is tipped into the dotted position of Fig. 4 to discharge its contents into the shoot *p*, or if the said shoot is in too high a position as indicated by dotted lines in Fig. 4, into a bucket *o* which is raised by tackle to the proper height and tipped into the shoot *p*. The shoot *p* which is telescopic (see Fig. 6), being composed of several lengths fitting into one another, is fitted to a frame *t* which carries rollers *u* running in contact with angle iron guides carried by the frame of the carriage of the machine *e*.

The weight of the fore end of the shoot is supported by running tackle *v* operated by a winch by means of which the inclination can be easily adjusted. The rear end is fastened to the ends of cords *w* which run over upper pulleys 1 and the barrels of the winch 2, by means of which the shoot may be hauled up and down and fixed at the proper height. The bucket *o* for taking the discharge from the mixer *k* and delivering it to the shoot *p* is balanced in a frame *x* raised and lowered in guides *y* by means of a cord *z* wound on a drum 4. Trip mechanism 5 is fitted to the bucket *o* for tipping the same when it arrives at the proper position for feeding the shoot *p*. The conveyor *h* by means of which the buckets *n n* are charged consists of a pair of frames fastened to the carriage of the machine *e* with which they move to and fro along the track. These frames carry endless belts *l l* which are arranged in any suitable manner and are worked from the engine on the machine *e*. The frames may also carry measuring hoppers 6 by means of which the requisite proportions of sand, shingle, *etc.*, may be measured onto the belt from the supply trucks which are run up alongside. If preferred however the measuring hoppers may be dispensed with and the men in the trucks can throw or guide their contents direct on to the belts in which the sand would come from one direction and the shingle from another and join each other in the bucket *n* where the proportions would be measured by a vertical division while the cement is added by the attendant in the required proportions. To regulate the proportions of the ingredients without the aid of hoppers 6, the attendant will have to watch carefully and regulate the speed of delivery of the belts *l l* by means of his clutches.

In the trench the usual appliances will be used for guiding the concrete

to any part desired (see Fig. 1) where the portable shoot 7 is shewn receiving concrete from the shoot *p*.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

(1) The combination of parallel tracks and apparatus carried thereby for use in excavating and concreting consisting of a track carrying the excavators a track carrying the trucks for removing the excavated material, a track carrying the concreting machine, a conveyor arranged to convey concreting materials to the concreting machine from a plurality of points in a direction parallel to the track, and a track carrying trucks for supplying concreting materials to the conveyor; the whole arranged for the purpose of supplying a concreting machine with materials without delay and without interfering with the removal of excavated material.

2. The combination of a concrete mixer and a conveyor for supplying materials thereto, said conveyor being adapted to be fed with concreting materials and arranged so as to be accessible to a number of men shovelling materials on to it simultaneously at a number of different points.

Dated this 7th day of August 1908.

NEWTON & SON,
6, Bream's Buildings, Chancery Lane, London, E.C.
Agents for the Applicants.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1909.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1

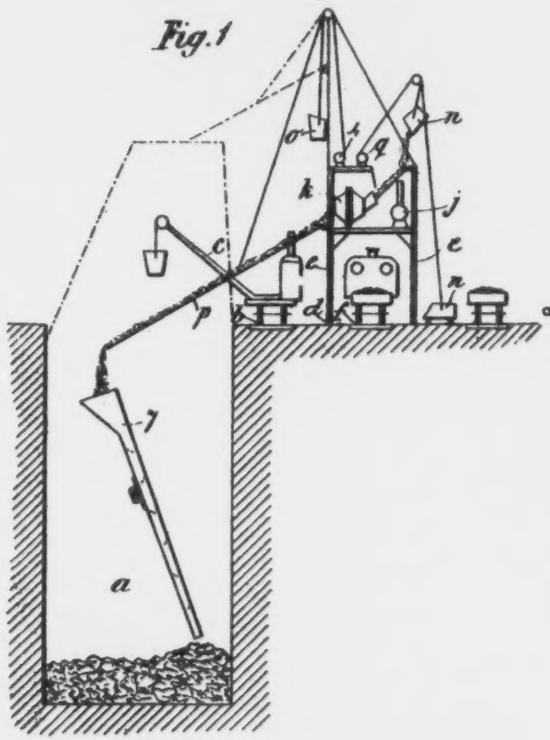


Fig. 2

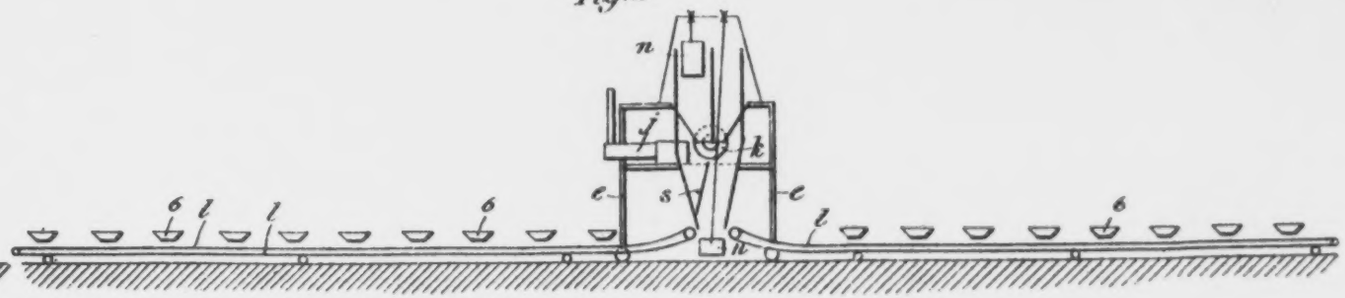
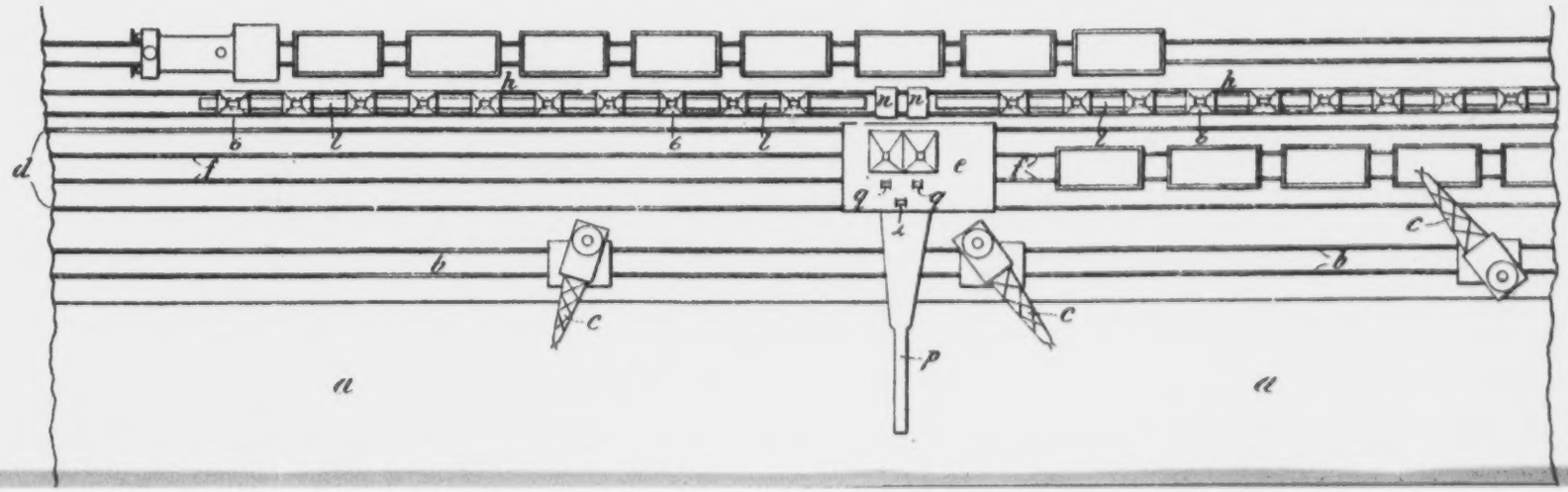


Fig. 3



[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 6

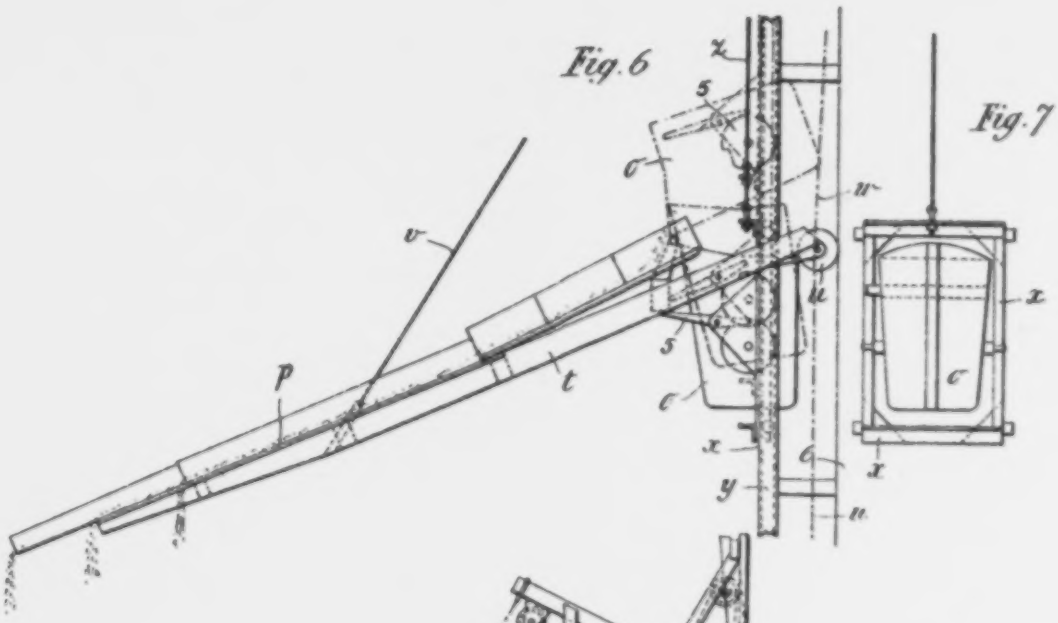


Fig. 7

Fig. 8

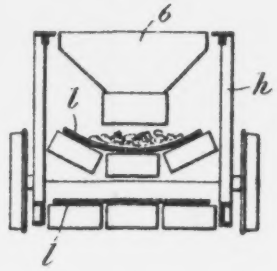


Fig. 4

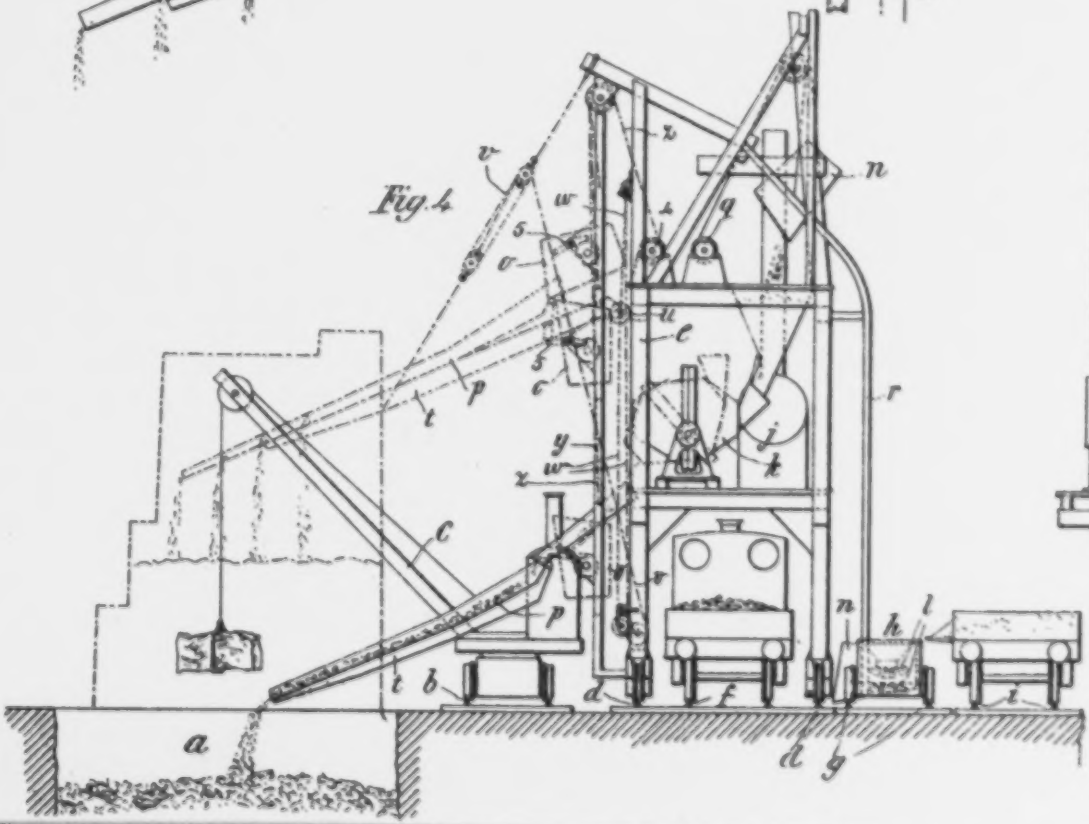


Fig. 5

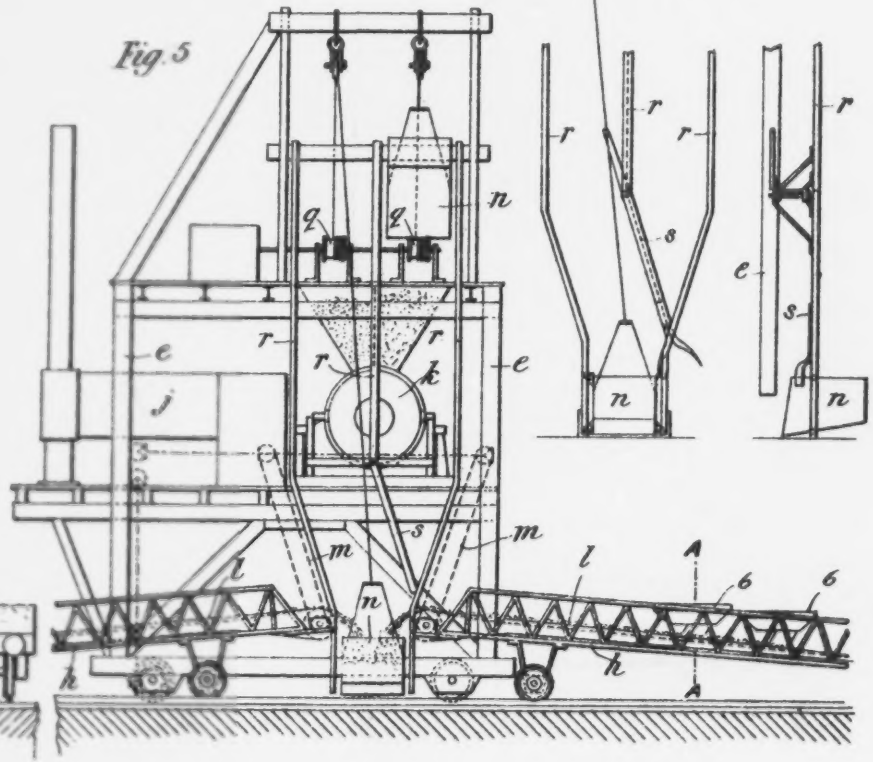


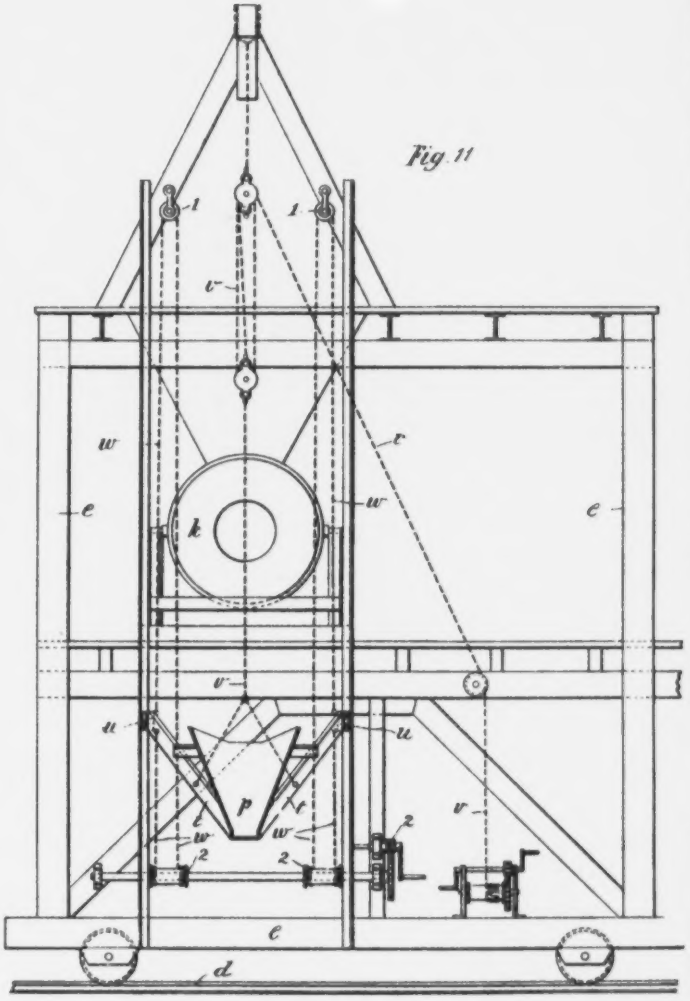
Fig. 9

Fig. 10

619–620
(3 SHEETS)
SHEET 3.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 11



Malby & Sons, Photo-Litho.

[fol. 621] IN UNITED STATES CIRCUIT COURT OF APPEALS FOR THE THIRD CIRCUIT, MARCH TERM, 1923

No. 2982

CONCRETE APPLIANCES COMPANY AND WILLIAM H. INSLEY, Plaintiffs-Appellants,

v.

JOHN E. GOMERY, JOHN C. SCHWARTZ, MICHAEL J. O'MEARA, AND CONCRETE CONSTRUCTION COMPANY, Defendants-Appellees

Appeal from the District Court of the United States for the Eastern District of Pennsylvania

Before Buffington, Woolley, and Davis, Circuit Judges

OPINION OF THE COURT—Filed July 4, 1923

BUFFINGTON, Circuit Judge:

In principle, this case concerns the use of gravity in conveying mobile substances from an elevated common central point to various working points; in application, to the distribution of "wet" or "mush" concrete.

Referring to the above general principle of conveying mobile matter by gravity, we have the age-worn practice of lifting water by power to a reservoir and by gravity distributing it through conduits to a fixed point or by hose to diverse points. In other words, the [fol. 622] problem of lifting it to a gravity-sufficient height; of there accumulating it in storage; from thence conveying it by conduit to a determined place or by hose to an optional point of use. Naturally such general practice was early applied to the movement of such a mobile matter as grain when its volume became large and the word "elevator" became a synonym for the raising, storage and distribution of grain, into individual cars, the ends of the same car, into ships, and indeed into separate hatches.

As an example of the common practice the proof is that prior to 1905 and since then, practically all elevators delivering grain to ships have been equipped with pipes, extending downwardly from the side of the elevator and supported by horizontally movable booms for directing the outlet of the pipes to any desired part of the boat, within range of the apparatus. But not only was such movable conduit's discharge pipe handled by the boom on the elevator, but where the change of the tide or the lower level of the ship, caused by loading, made it desirable, a second or supplemental hopper and an additional spout were suspended from and handled by a boom and tackle on the ship itself. This supplemental hopper received the discharge from the elevator spout and discharged it into the vessel as change of tide or the settling of the vessel necessitated. The proofs further show that where two ships were lying

side by side and it was desired to spout the grain to an outlying, or "second-off" one, it was done by such elevator appliances in spite of the long stretch required. It was also a common practice to provide the spout with a telescopic extension end by which further horizontal reach was effected, due to the varying positions of the ship. Moreover, it will be noted that on such apparatus the function of the boom was not only to raise, lower and swing the spout to [fol. 623] reach the hatches of the ship under different conditions of load and tide, but also to draw up and house the spout so as not to interfere with the navigation or movement of the vessel.

The same general type of grain elevator appliance was used for loading cars. The proof is that "the hopper ends of the spouts were constructed with an enlargement, forming hoppers, and grain spouts were connected to them in the elevators * * * All types of movable and fixed spouts were used in grain elevators at that time, of the movable type, those in the grain elevators were either portable or so constructed that they revolved around a fixed point * * * Outside of the buildings they had spouts for shipping grain to cars, which were generally fixed in position with a telescope and either with one opening or two, so arranged that grain could be thrown into either end of the car." Without further statement, it will be seen that the steps of lifting grain to get gravity; of storing to get quantity; of chuting to get delivery; and of boom swing and trough shift to vary locality of delivery; and also of duplication of these shore appliances by supplemental boom and conduit on shipboard; had all been advanced to a high state of efficiency and delivery point variation in elevator grain practice.

The same may be said of coal practice, the proofs showing the contemporaneous use of "coal chutes in connection with coal elevators in stock piles, where the coal was elevated and spouted out through the side of the building into a stock pile and into bins. The spout would be supported in a similar manner to the spouts heretofore referred to as shipping spouts in connection with grain elevators," that is, "that the spout could swing in any direction and was suspended from a swinging boom."

Later, when concrete docks, piers and the like came to be built, [fol. 624] it was quite natural for contractors to use in building them the apparatus used for grain chuting and to handle and chute concrete in the same way. And such, the proofs show, was the case as will be seen by reference to but one or two operations. In November, 1906, a concrete foundation for an intake and pumping station was built by the Great Lakes Dredge and Dock Company at Gary, Indiana. Here a car was used on which was a mixer from which the concrete was discharged into a hopper or chamber and from which chutes, suspended from a boom located on the car, chuted the mied concrete down to the coffer dam where it flowed either into piles or was poured in place, the dam being some forty feet in width and of great length. The chutes in the apparatus could be moved up, down and sideways. The apparatus was used for several months and was constructed by a man who had never seen concrete so handled, but had seen it used in grain elevators.

In addition to the testimony of the builder of this apparatus, another witness testified as follows:

"The first apparatus we used was a concrete mixer set on a flat car, and the concrete was spouted from the mixer into the bottom of the excavation. We called it chutes then. There was an improvement made on this apparatus to distribute the concrete from one location to another within a radius controlled by a boom holding the chutes or spouts. The ends of the spouts were—the location of the ends of the spouts were placed by swinging the boom that carried the concrete spouts."

The same man the next year used similar apparatus in building a concrete dock at the same place. In this case the apparatus was placed on a scow, a mast being placed in front of a mixer, a boom placed on such mast and a chute suspended by tackle therefrom. [fol. 625] As to its mode of operation, the constructor testified:

"It is dumped out of the mixer into a bucket, and conveyed up with a cable in a bucket, and dumped into a hopper which is fastened on the tower; and we have one 50-foot section of 12-inch pipe carried by two booms and fastened on the bottom of the hopper, and as occasion requires placing concrete in forms, we have 8-foot sections or 10-foot sections to take on or off.

Q. How could you change the point of delivery of the lower end of the pipe?

A. By adding on a section 10 feet long, or taking it off, as occasion required.

Q. Was there any other way to change the point of delivery?

A. By swinging booms and swinging pipe.

Q. Was this apparatus successful?

A. Very successful."

Another witness described it thus:

"This apparatus is a concrete equipment built on a scow, consisting of a concrete mixer at the proper elevation, so that concrete could be spouted into the concrete dock; and above the mixer was constructed two hoppers, one for stone and one for sand, this being at one end and the other end of the scow being the cement shed. A boom was placed to support the chute, for the purpose of raising the spout so that the concrete equipment could be moved—I meant to state for the purpose of spouting the concrete in the forms for the dock, and also to raise the spout when moving the equipment ahead."

He further testified that the number of chute sections used was determined by the distance from the mixer to the concrete forms and that as much as five or six such sections were used on this work and that the dock itself was five thousand feet long.

[fol. 626] There is proof of the use at San Francisco harbor in 1904-5-6 of substantially similar concrete chuting apparatus placed on a scow. It clearly shows the use of chutes moved to different

positions by a boom. A witness thus describing the boom's action said:

"Well, the boom is the bottom end of it, and sets in a hinged socket, I would call it, and the outer end has a sheave in the end of it, the cable runs from the donkey engine to the sheave in the outer end, which is used to handle the pipe that carries the cement to the cylinders. All the use of this boom is to handle the pipe that carries the cement."

Moreover, a study of the proofs satisfy us that from the time concrete came into use there had been a struggle between the architects and designers, who, as a class, favored the use of dry concrete which would not flow, and the contractors, who, for construction convenience favored wet or mush concrete, which would flow and therefore allow the use of distribution chutes, and that as soon as the use of wet concrete became general, the art used the wet concrete chutes, which it could not use for the dry. In that regard, the proof was that "The more reinforced concrete came into use, the more contractors used wet concrete; and I should say that from 1908 on very much the greater portion of construction work was done in concrete than before; hence, also, the more wet concrete was used since that time." In these evolutionary stages of the concrete art, the proof is that the builders of grain elevators took a leading part in the use and distribution of wet or mush concrete. In that regard, the proof is:

"Architects in general prior to the year 1904-05 demanded that concrete be mixed what is known as very dry, and to such a consistency that it required considerable tamping to make the water flow on top; but grain elevator designers and contractors have never [fol. 627] been governed by architects' rules and guidance or specifications, as the elevator designer generally built the elevator that he designed, or that some other Company designed; therefore they were a sort of law to themselves, and, in my opinion, were the first designing engineers and contractors to use what is known in the trade as 'wet' or 'sloppy' concrete. In my opinion, this was brought about by the use of what is called 'slip' of 'movable' forms. By the use of such forms, which is usually about 4 ft. high, the wall, column, or girders, is formed by filling the movable form with sloppy concrete and reinforcing, and at the same time constantly raising the form by a series of jack screws supported on steel bars, which are embedded in the concrete. The jack screws are fastened onto these bars, and by turning down the jack screw the form is forced up; thus making the structure one monolithic mass; but to do this the concrete had to be run into the form in a liquid state, and such a liquid state that it did not require tamping, but only spading. * * *

"From the mixer the concrete was spouted into a hoist hopper. This hoist hopper was hoisted by power to the top of the building as it was in course of construction. When reaching the top a gate, which was provided on the side of this first hopper, was opened and

the concrete material allowed to discharge through a spout into another similar hopper, but stationary. This last named hopper was usually located about from 15 to 20 ft. away from the side of the hoist tower, and in the elevator work was supported on the movable form. From this hopper the concrete was drawn into wheelbarrows or concrete carts, and with these distributed into the various walls, columns and floors."

An engineering witness described the evolution and growing use of wet concrete in this way:

"About 1902, there was considerable agitation among engineers [fol. 628] of all kinds dealing with foundations, as to wet or dry concrete. The engineering fraternity was divided into two camps about that time, one advocating a concrete mixed quite dry and thoroughly tamped, and the other advocating using a concrete mixed quite wet or mixed to a consistency which would enable it to flow easily, and which did not require tamping after being placed. This agitation, to my knowledge, extended over a period of about five years, the wet fellows arguing that from a constructional standpoint the concrete was easier and more cheaply placed and made a more dense mixture. About this time, also, 1902, I joined the Western Society of Engineers and attended the meetings quite frequently, and heard papers read by different engineers on both sides of the question. The use of reinforcing steel in concrete became more customary about 1902, and a former professor of civil engineering of the University of Illinois, Prof. Pence, read a paper before the Western Society of Engineers, describing tests he had made as to the expansion coefficient of concrete, with relation to the expansion coefficient of steels.

* * * * * * *

"These experments brought out the fact that it was possible to use steel and concrete together, so far as the expansion coefficient was concerned, and following this with the increased use of reinforcing steel in concrete it was almost imperative that a wet concrete be used in order to have it properly placed around reinforcing steel. Really, according to my opinion, the introduction of reinforcing steel made it imperative that concrete more of a consistency of a liquid be used in order to build the structures then being designed, and this fact made it imperative that in handling this liquid concrete the chute or trough come into play."

Sensing the gradual increased use of the concrete art through [fol. 629] these experimental years, it would seem from the proofs that the grain elevator contractors led the way in the broader use of mobile concrete and that as the engineer determined the coefficient of relative expansion of steel and concrete was such as to permit their joint use in reinforced building construction generally, the consequent and indeed the insistent call for the use of wet or fluid concrete became more imperative, because such concrete could

be better placed around reinforcing steel and that this use of fluid concrete naturally brought with it the employment of fluid carry-

This insistent call for wet concrete was evidenced by the building requirements made by the city of San Francisco after the earthquake and fire catastrophe. In that regard an experienced engineer who went there from the East to study building conditions testified:

"There are so many different types of buildings in old San Francisco, but, roughly, the most decided change, I believe, was the general adoption of more concrete in the construction of the new buildings. As a rule concrete was substituted for former brick and tile construction wherever possible. Shortly after the earthquake two types of buildings were officially recognized by San Francisco, and generally through California, i. e., class A type, which consisted of a steel frame fireproofed by concrete; and class B building, which consisted almost entirely of reinforced concrete. This necessitated the more general use of wetter concrete than had been practiced heretofore, as walls and floors and fireproofing were of the minimum thickness allowed by safety, and could not be constructed with the older methods of dry concrete."

It is no reflection on the patent office of the United States, but simply an instance of how often the theoretical expert of an art is in his office oblivious to the atmosphere of practical accomplishment [fol. 630] in the field of achievement when we note that unconscious of this wide growing and much discussed use of wet cement the patent office, on November 2, 1909, granted Patent No. 939,072 to A. D. Ney, which was based on the specification statement by him made July 10, 1909, that "In the making of concrete, it has hitherto been the general practice in mixing the materials as stiff as possible, using only sufficient water to cause the adherence of the material together, and thereafter tamping the material to cause the mass to be as compact as possible in its relatively dry condition. In the operation of making the product of the present invention, a radically different method is followed in that an abundance of water is employed in order not only to permit gravity to bring the mass to a solid, compact condition and thereby dispense with the ramming operation, but also to provide sufficient water for the purpose of crystallization. The process of forming the present process is essentially a wet process, and distinguished from the relatively dry process employed in making concrete."

In the actual state of the working art which the proofs quoted above show in fact existed, and with the measure of the art, as evidence by the Nay patent above quoted, then held by the patent office, Callahan and a number of other alleged inventors, who thereafter were thrown into interference with each other, applied for patents which had in view the spouting or chuting of wet concrete. Without attempting to settle the questions of priority between these claimants, we may say that the period which embraces their several dates is confined to a comparatively narrow compass and to our mind they all serve to show that at or about the same time the natural mechanical evolution of the concrete art and the possibility of the use of

wet concrete mechanically, but instictively, led all these men to adopt [fol. 631] the same general types of mechanical appliances for the chuting wet concrete. It is a situation to which we feel we may reapply what was said by this Court in Elliott v. Youngstown, 181 Fed. Rep. 349: "Nor is it necessary to dwell upon the suggestion that applications were made for blue print machines with an automatic cut-off by four different inventors about the same time, Fullman and Herman among the rest. The fact that so many persons caught the idea goes rather to prove that it was simple and obvious, and not that it required inventive genius to conceive. It is not like the case where the art is waiting for the device, and inventors striving unsuccessfully to produce it, under which circumstances invention may well be held to appear."

Restricting ourselves therefore to the single one of these group inventors, we note that on January 21, 1909, Lee Callahan applied for, and on February 8, 1910, was granted, Patent No. 948,719, here in suit, for a material transferring apparatus. As stated in the specification, Callahan's alleged invention had "for its general object to provide an apparatus calculated to be used to advantage in transferring concrete or other plastic material from a suitable source of supply to points desired on a building that is being built." It also stated a second general purpose was "to provide an apparatus of the kind stated adapted more especially for use when a building is to embody reinforced concrete." And likewise a third, viz: "for transferring other material from the ground to the points desired on a building in course of construction." On his apparatus, Callahan was allowed the claims here in question, viz: 1, 2, 5 and 13, of which the first reads:

"An apparatus for the purpose described, comprising a tower, a suitably supported horizontally movable boom connected therewith, a conduit carried by the boom, means for raising plastic material [fol. 632] to a suitable point in the height of the tower, and means for receiving plastic material from said raising means and conducting the same to said conduit."

This is fairly illustrative of the elements of the other three claims. The elements of the quoted claim are first "a tower"; second, "a suitably supported horizontally movable boom connected therewith"; third, "a conduit carried by the boom"; fourth, "means for raising plastic material to a suitable point in the height of the tower," and fifth, "means for receiving plastic material from said raising means and conducting the same to said conduit."

Comparison of Callahan's apparatus with the prior art shows that it really constituted no advance over that art, but on the contrary, rather a step backward. For example, he either had no knowledge of the use of the open trough or chute, or if he had he made no mention of it or suggestion of its possible use, confining his specification and limiting his claims to "a conduit" or closed pipe. And the proof is that this closed conduit of his claims soon proved worthless on account of clogging and had to be supplanted by the

open chute of the earlier art. There was of course nothing new in his element of his elevating tower. That was as old as the elevator art. Making it extensible from story to story involved no more invention than if he had built his tower complete at the start and allowed his building to build up to tower height instead of the tower to the building height. His means to convey material up the tower was only another name for an elevator cage or container of suitable form and capacity. A receptacle for storage at the top was a common practice in grain and coal devices and a boom to carry a chute or trough was common in the grain and concrete arts. In fact, we [fol. 633] are unable to find any element of novelty either in the separate elements Callahan used or in the unification of such elements in the apparatus he suggested. Had the actual state of the prior art been shown to the patent authorities we cannot feel they would have granted this patent and while we feel embarrassed to find ourselves at variance with the Circuit Court of Appeals of the Sixth Circuit, which in the case of Concrete Appliances Co., et al. v. Meinken, et al., 262 Fed. 958, found this patent valid, we feel assured that the merger record before that court wholly failed to disclose the now uncontradicted proofs on which we base our conclusions.

In the advance in the concrete building art with the extension towers to great heights and chutes to great distances, the very magnitude and scale of the work are such as to impress the onlooker and there is danger of one's being misled by their very magnitude into the belief that they must involve invention, but when their principle is sensed it will be found the known principles and practice which marked the art long before this patent, have simply enlarged as construction enlarged its operation. That growth is in this case due to the appreciation of wet concrete and convinced as we are that in roads, piers, docks, bridges and buildings generally, concrete is the growing material of the future, we believe its advance should be in no way embarrassed by this patent by which the art is now sought to be blanketed. The Court below held the patent was not infringed; we go a step further and hold Callahan so far as the claims here involved are concerned, had no such patent claims to infringe. The cause will therefore be remanded to the Court below to modify its decree by adjudging the claims in controversy invalid and as thus modified the decree is affirmed.

[fol. 634] In United States Circuit Court of Appeals

Decree—Filed July 24, 1923

Appeal from the District Court of the United States, for the Eastern District of Pennsylvania.

This cause came on to be heard on the transcript of record from the District Court of the United States, for the Eastern District of Pennsylvania, and was argued by counsel.

On consideration whereof, it is now here ordered, adjudged and decreed by this Court, that the decree of the said District Court in this cause be, and the same is hereby modified so as to adjudge the claims in controversy invalid, but otherwise affirmed, with costs.

Victor B. Woolley, Circuit Judge.

Filed January 23, 1924

Philadelphia, July 24, 1923.

On an application with respect to costs reasonably made within the term of the decree, the above order is vacated.

Victor B. Woolley, Circuit Judge.

IN UNITED STATES CIRCUIT COURT OF APPEALS

ORDER MODIFYING DECREE—Filed January 31, 1924

Having heard and considered the application of the appellants that the costs in this cause, taxable against them, be limited to such as were actually paid by the defendant users of the alleged invention of [fol. 635] the patent; and being of opinion that the manufacturers which supplied the defendants with the alleged infringing appliances and openly defrayed in part the expenses of this litigation are to that extent privy to the action.

It is on this thirty-first day of January, 1924, ordered, adjudged and decreed that this cause be remanded to the District Court of the United States for the Eastern District of Pennsylvania, that the said court modify its decree by adjudging the claims in controversy invalid, and as thus modified the decree is affirmed, with costs to the appellees covering their proper disbursements as users and the proper disbursements of the manufacturers supplying them with the alleged infringing appliances.

Victor B. Woolley, Circuit Judge.

UNITED STATES OF AMERICA,
Eastern District of Pennsylvania,
Third Judicial Circuit, Set.:

[fol. 636] IN UNITED STATES CIRCUIT COURT OF APPEALS

CLERK'S CERTIFICATE

I, William P. Rowland, Deputy Clerk of the United States Circuit Court of Appeals, for the Third Circuit, do hereby certify the foregoing to be a true and faithful copy of the original Record in three volumes and the proceedings in this court in the case of Concrete Appliances Co. and William H. Insley, Appellants, vs. John E.

Gomery, John C. Schwartz, Michael J. O'Meara, and Concrete Construction Co., Appellees, on file, and now remaining among the records of the said Court, in my office.

In testimony whereof, I have hereunto subscribed my name and affixed the seal of the said Court at Philadelphia, this 3rd day of March in the year of our Lord one thousand nine hundred and tweny-four and of the Independence of the United States the one hundred and forty-eighth.

Wm. P. Rowland, Deputy Clerk of the U. S. Circuit Court of Appeals, Third Circuit. (Seal of United States Circuit Court of Appeals.)

[fol. 637] SUPREME COURT OF THE UNITED STATES

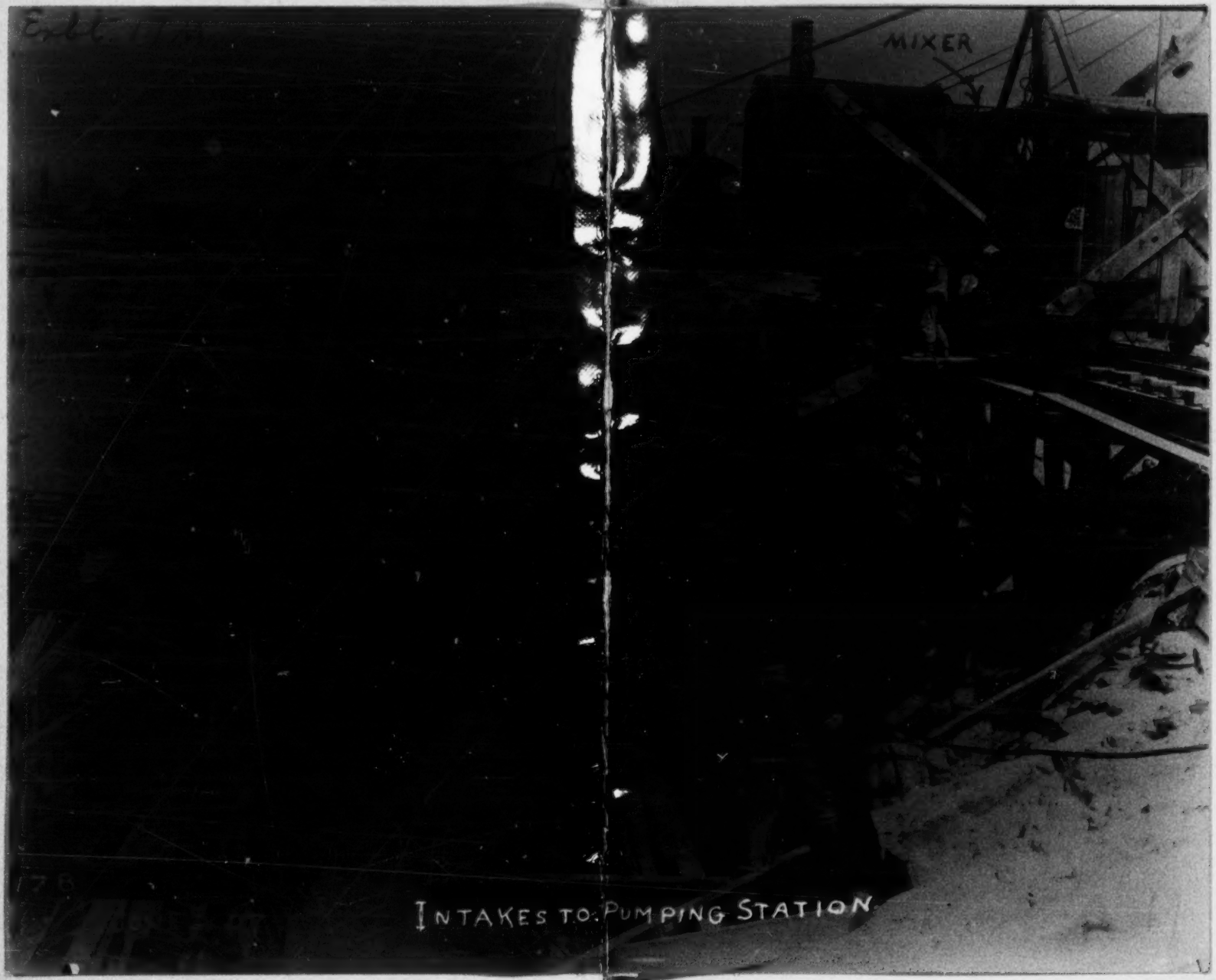
On petition for Writ of Certiorari to the United States Circuit Court of Appeals for the Third Circuit

ORDER GRANTING PETITION FOR CERTIORARI—Filed April 7, 192[illegible]

On consideration of the petition for a writ of certiorari herein to the United States Circuit Court of Appeals for the Third Circuit, and of the argument of counsel thereupon had,

It is now here ordered by this Court that the said petition be, and the same is hereby, granted, the record already on file as an exhibit to the petition to stand as a return to the writ.

END



END

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1924.

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No. ~~307~~ 44.

CONCRETE APPLIANCES COMPANY AND WILLIAM H. INSLEY,

Petitioners,

vs.

JOHN E. GOMERY, JOHN C. SCHWARTZ, MICHAEL J. O'MEARA, AND CONCRETE CONSTRUCTION COMPANY,

Respondents.

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